Zool.
84 ls

Bulletin

8° Sect. 84 = 8

Department of the Interior:

U. S. NATIONAL MUSEUM.

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

NO. 27.—DESCRIPTIVE CATALOGUES CONSTITUTING A REPORT UPON THE EXHIBIT OF THE FISHERIES AND FISH CULTURE OF THE UNITED STATES OF AMERICA, MADE AT THE LONDON FISHERIES EXHIBITION, 1883.

PREPARED UNDER THE DIRECTION OF

G. BROWN GOODE, U. S. COMMISSIONER,

AND A STAFF OF ASSOCIATES.

27

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

= Gesch. p. 825
358 Cf

Department of the Interior:

U. S. NATIONAL MUSEUM.

—33—

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 27.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

ADVERTISEMENT.

This work is the thirty-third of a series of papers intended to illustrate the collections of natural history and ethnology belonging to the United States, and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

The publications of the National Museum consist of two series—the Bulletins, of which this is No. 27, in continuous series, and the Proceedings, of which the sixth volume is now in press.

The volumes of proceedings are printed signature by signature, each issue having its own date, and a small edition of each signature is distributed to libraries promptly after its publication.

From time to time the publications of the Museum which have been issued separately are combined together, and issued as volumes of the Miscellaneous Collections. These are struck off from the stereotype plates from which the first edition was printed, and in this form are distributed by the Smithsonian Institution to libraries and scientific societies throughout the world. Volume 13 of these collections includes Bulletins 1 to 10 inclusive; volume 19, vols. 1 and 2 of the Proceedings; volume 22, vols. 3 and 4 of the Proceedings; and volume 23, Bulletins 11 to 15 inclusive.

Full lists of the publications of the Museum may be found in the current catalogues of the publications of the Smithsonian Institution.

SPENCER F. BAIRD,

Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, October 1, 1884.

GREAT INTERNATIONAL FISHERIES EXHIBITION, LONDON, 1883.

DESCRIPTIVE CATALOGUES

OF THE

COLLECTIONS SENT FROM THE UNITED STATES

TO THE

INTERNATIONAL FISHERIES EXHIBITION,

LONDON, 1883,

CONSTITUTING

A REPORT UPON THE AMERICAN SECTION.

PREPARED UNDER THE DIRECTION OF

G. BROWN GOODE, U. S. COMMISSIONER,

AND A STAFF OF ASSOCIATES.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

BIBLIOTHECA
REGIA
MONACENSIS

UNITED STATES OF AMERICA.

SPENCER F. BAIRD, *U. S. Commissioner of Fish and Fisheries.*
GEORGE BROWN GOODE, *Commissioner to the Exhibition.*

STAFF.

*TARLETON H. BEAN,
MARSHALL McDONALD,
RICHARD RATHBUN,
*R. EDWARD EARLL,
LIEUT. FRANCIS WINSLOW, U. S. N.,
*JOSEPH W. COLLINS,
*A. HOWARD CLARK,
*WILLIAM V. COX,
*RANDOLPH I. GEARE,
*REUBEN WOOD,
*HUBBARD C. CHESTER,
*ROMYN HITCHCOCK.

*LIEUT. CHARLES H. McLELLAN, U. S. R. M., *in Charge of Life-Saving Service Exhibit.*
*MAX HANSMANN, *in Charge of Light-House Board Exhibit.*
*SERGT. JAMES MITCHELL, U. S. ARMY, *in Charge of Signal-Service Exhibit.*

*Present during the whole or a part of the exhibition.

ABRIDGED TABLE OF CONTENTS.

	Page.
Introductory note	
Preface	
List of persons engaged in the preparation of the collection exhibited by the Government	
Lists of special exhibitors, and of prizes awarded (see also Concordance, pp. 87–105)	
General table of contents	
A. Preliminary catalogue, and synopsis of the collections exhibited by the United States Fish Commission, and by special exhibitors. pp. [3]–[87].	1–85
AA. Concordance of the official classification for the use of the juries. pp. [89]–[107]	87–105
B. Collections of Economic Crustaceans, Worms, Echinoderms, and Sponges. By Richard Rathbun. pp. [1]–[31]	107–137
C. Catalogue of the Aquatic and Fish-eating Birds exhibited by the U. S. National Museum. By Robert Ridgway. pp. [1]–[46]	139–184
D. Catalogue of the Economic Mollusca and the apparatus and appliances used in their capture and preparation for the market. By Lieut. Francis Winslow, U. S. N. pp. [1]–[86]	185–270
E. The Whale Fishery and its appliances. By James Temple Brown. pp. [1]–[116]	271–386
F. Catalogue of the Collection of Fishes. By Tarleton H. Bean. pp. [1]–[124]	387–510
G. Catalogue of the Collection illustrating the scientific investigation of the sea and fresh waters. pp. [1]–[109]	511–622
H. Catalogue of the Aquatic Mammals. By Frederick W. True. pp. [1]–[22]	623–644
I. Catalogue of the Collection illustrating the fishing vessels and boats and their equipment; the economic condition of fishermen; anglers' outfits, &c. By Capt. Joseph W. Collins. pp. [1]–[179]	645–823
J. Catalogue of the Apparatus for the capture of fish. By R. Edward Earll. pp. [1]–[206]	825–1030
K. Catalogue of Fishery Products and of the apparatus used in their preparation. By A. Howard Clark. pp. [1]–[124]	1031–1154
L. Catalogue of the Fish-cultural Exhibit. pp. [1]–[95]	1155–1249
Alphabetical index	

INTRODUCTORY NOTE.

Prof. SPENCER F. BAIRD,

U. S. Commissioner of Fish and Fisheries:

SIR: I have the honor to submit herewith a preliminary report upon the participation of the United States in the Great International Fisheries Exhibition at London in 1883, together with a series of descriptive catalogues constituting a detailed report upon the materials and objects exhibited under the direction of the United States Fish Commission, a considerable portion of which was a temporary loan from the collections of the U. S. National Museum.

Very respectfully,

G. BROWN GOODE,

U. S. Commissioner to the Exhibition.

The present volume is made up of the descriptive catalogues of the articles brought together by the United States Fish Exhibition for exhibition at the Great International Fisheries Exhibition held in London from May 12 to November 1, 1883. The exhibits catalogued are, for the most part, permanently retained in the National Museum of the United States, maintained under the direction of the Smithsonian Institution.

Seven of the twelve parts of this catalogue (A to G) were published and distributed during the Exhibition, the remainder having been printed from time to time. It should be stated that part A, designated as the preliminary catalogue, which was an enumeration of all the articles exhibited by the United States and by private collectors, and containing everything which was necessary for the information of jurors or visitors to the Exhibition, was printed and ready for distribution at the opening of the Exhibition, and was also included in an abridged form in the first edition of the official catalogue which was published on the same day. The subsequent parts of the series, which for the lack of a better name have been called catalogues, and which it was found most

convenient to arrange in the form of descriptive catalogues, constitute what is essentially a very detailed report upon the collections exhibited in the American section, including not only the articles belonging to the Fish Commission and the National Museum, but also those shown by private exhibitors. It has been thought best, with your approval, to publish these catalogues in collective form as a report upon the exhibits made by the United States. To supplement this descriptive part of the report I shall endeavor in this place to present a succinct account of the organization and management of the American section at the Fisheries Exhibition, supplementing this by a list of the awards made to American exhibitors. This volume will then include everything that is necessary for the understanding of the operations of the Government Commission appointed to arrange for the participation of the United States in the great International Fisheries Exhibition at London.

I have now in preparation, and shall submit to you in the course of a few weeks, my executive report upon the Exhibition, together with reports upon the present condition of the fisheries in Europe, called for by the joint resolution of Congress in reference to this Exhibition. At the same time I shall submit a similar report upon the Fisheries Exhibition held in Berlin in 1880, the publication of which has been deferred for reasons which it is unnecessary here to explain.

The first public step in the organization of the London Fisheries Exhibition appears to have been a proposal made by Mr. Edward Birkbeck, M. P., on the occasion of the forty-third anniversary dinner of the Thames Angling Association, held at Richmond on July 16, 1881. The suggestion was enthusiastically taken up, and the idea of an international exhibition, similar in scope to that held at Berlin in 1880, soon grew into favor. A private meeting was held on August 5, at Fishmongers' Hall, under the presidency of the Marquis of Exeter, at which a preliminary organization was perfected. On Friday, November 25, a meeting of the general committee was held at Fishmongers' Hall, on which occasion it was announced that His Royal Highness the Prince of Wales had accepted the position of presidency to the Exhibition.

The subsequent steps in the organization will be recorded in the executive report already referred to. On the 3d of May, 1882, the Government of the United States received an official invitation from the British Government to participate in the Fisheries Exhibition.

On the 15th of June Mr. Charles G. Williams, of the Committee on Foreign Affairs, reported a joint resolution in the House of Represent-

atives authorizing the participation in the Exhibition on the part of the United States and appropriating the sum of $50,000 for the purpose.

The Senate having concurred in this resolution, preparations were immediately begun under your direction and were carried on with great activity. Most of the officers of the National Museum and Fish Commission contributed to the success of the work by their enthusiastic co-operation. Special acknowledgment is due to the persons mentioned in the list on pages 7 and 8, and especially to those in the list of collaborators whose services are recognized as having been of the greatest importance.

On the 26th of February a preliminary exhibition of such materials as could be conveniently displayed was held in the National Museum, continuing two evenings and two days, and was attended by at least 5,000 visitors.

The work of packing the collections for transmission to London was begun on the 27th of February; the first shipment of goods was made on the 7th of March, the last on the 14th of April. A satisfactory arrangement was made, through the agency of Col. Thomas Donaldson, (1) with the Pennsylvania Railroad Company for the transmission of the collections to New York, and placing them on board of the steamer; and (2) with Messrs. Patton, Vickers & Co., agents of the Monarch Line of steamships, between New York and London, for reduced freights; the rates given covering the transmission of the collections to London, and back to New York.

Having, upon your nomination, received from the President the appointment of Commissioner to the Exhibition, the following persons were by you designated as members of my staff to proceed with me to London and to carry on the administrative work connected with the United States section at the Exhibition: Dr. Tarleton H. Bean, Mr. R. Edward Earll, Capt. Joseph W. Collins, Mr. A. Howard Clark, Mr. William V. Cox, Mr. Reuben Wood, and Capt. H. C. Chester. All of these gentlemen were permanent members, of long standing, of the staff of the Fish Commission and National Museum, excepting Mr. Wood, who was selected to represent the angling interest, being one of the champion fly-casters of the United States and an expert in all matters relating to fine tackle. In addition to those already named, Lieut. C. H. McLellan, U. S. R. M., was detailed by the Life-Saving Service, Mr. Max Hansmann from the Light-House Board, and Sergeant James Mitchell, U. S. A., from the Signal Office, to accompany and install the collec-

tions sent over by their respective departments. Mr. R. I. Geare also accompanied the party as stenographer for work upon the report.

The collections arrived in London in excellent condition. It was soon found that the space of 10,000 feet asked for by the United States was entirely inadequate for the purposes, being inconveniently arranged and badly cut up by partitions and passage-ways. Additional but insufficient space was subsequently obtained in various parts of the Exhibition grounds, the most useful portion being a section of about 2,500 feet graciously conceded by the Danish commissioner, Mr. Howitz. The life-boats were placed in a shed, erected by us, in one of the gardens, three of the fishing-boats upon the lake, and the salted, smoked, and preserved fish in a special building, put up for articles of this description, in an unfortunately remote portion of the grounds.

After the opening several weeks were occupied in attaching labels and finally adjusting the collections, but by June 1 everything was in thorough order, and the section was generally admitted to possess great interest and to be the most important single division of the entire exposition, both on account of its contents and the manner in which they were displayed.

I desire, in behalf of my associates and myself, to acknowledge the courtesy and aid received at the hands of the managers of the Exhibition, particularly Mr. Edward Birkbeck, chairman of the executive committee, to whom indeed the inception and the success of the Exhibition are mainly to be attributed, Professor Huxley, Sir Philip Cunliffe Owen, Mr. A. J. R. Trendell, literary superintendent, Surgeon-General Francis Day, Mr. Fell-Woods, Mr. W. Oldham Chambers, the Earl of Lauderdale (Sir James Gibson-Maitland), the Marquis of Hamilton, the Earl of Ducie.

Special acknowledgments are also due to Mr. James Russell Lowell, minister to the court of St. James.

General E. H. Merritt and Col. L. G. Mitchell, consul-general and vice-consul of the United States in London, and Mr. W. J. Hoppin, secretary of legation, and Mr. William Wesley, should also be mentioned as having rendered important aid.

From the opening of the Exhibition, on May 12, to its close, October 30, the buildings and grounds were thronged with visitors, not only in the day, but at night, when the buildings and grounds were illuminated by electric lights. The Exhibition was a favorite resort for the London people through the summer, and was rendered more attractive by two

daily open-air concerts by military bands. The total number of visitors was 2,690,000, a daily average of 18,545.

The success of the participation of the United States was greatly increased by the fact that so many experts were employed upon its staff, and were constantly in attendance to explain and give significance to the collections: Captain Collins in everything relating to sea fisheries, vessels, and boats; Mr. Earll in fish culture and the lake fisheries; Dr. Bean in marine zoology; Captain Chester in whaling and sealing; Mr. Clark in fishery products; Lieutenant McLellan in life-saving apparatus; Mr. Hansmann in light-house affairs; Mr. Wood in angling and fine tackle, and Sergeant Mitchell in the work of the weather bureau. No such attempt was made by any of the other countries, but its success was so manifest that it is hoped that it may serve as a precedent in future exhibitions.

The presence of these specialists was also important in connection with the work on the official report of the Exhibition, and the present state of the fisheries of Europe, which, as has been stated, is now being prepared in accordance with the provisions of the act of Congress directing our participation, and which I shall have the honor of submitting within a few months.

An international exhibition of agriculture and the fisheries was held at Aalborg, Denmark, in June. In response to an invitation from the authorities, there were sent to this Exhibition a number of objects, which we had no room to display in London. The result was the award of a silver medal to the United States Fish Commission, and ten bronze medals to special exhibitors, chiefly of fishery products.

A detailed list of prize winners at London and Aalborg is given below.

After the formal close of the Exhibition the work of packing the collections for reshipment was at once taken up by Messrs. Earll, Chester, and Cox, the other members of the party having returned to their posts in Washington before the close of the Exhibition; and before the end of the year, the entire collection, in all between 500 and 600 tons, cubic measurement, had been returned to Washington, and the work of setting them up in the permanent fisheries gallery of the National Museum had been begun. Many important accessions to the collections were received during the Exhibition, chiefly by exchange, prominent among which were collective exhibits from Greece, Spain, India, Sweden, and China; an Irish curragh from the Marquis of Hamilton, illus-

trations of the net-making, from Mr. W. B. Tegetmeier; a Danish vessel model from Mr. Arthur Feddersen, of Viborg, &c. A considerable collection of fish-cultural appliances was given to the new National Fisheries Museum at South Kensington in exchange for objects from India and China.

Since the return of the collections to Washington, all the members of the staff, with some assistance from the persons already mentioned as having taken part in the preliminary preparation, devoted much time to the permanent installation of the material in the National Museum building. A considerable portion of the collections, especially the natural history specimens, has been returned to the various departments of the Museum from which it was temporarily withdrawn. The remainder of the material, consisting of those objects which pertain directly to the prosecution of fishing in the United States and elsewhere, now constitute the fishery section of the National Museum, of which Mr. R. E. Earll has been designated curator. On the evening of May 14 the fishery section was formally opened to the public.

The medals and certificates of award were received from London and distributed in January and February; the diplomas to accompany the medals have not yet been received, but are expected before the end of the year.

In the more detailed report upon the Exhibition I shall have occasion to allude to the many important results of these exhibitions and of the lessons they should teach to the people of the United States.

PREFACE.

THE FISHERIES OF THE UNITED STATES.

[Reprinted from the Official Catalogue, pp. 175, 176.]

In 1880, according to the returns of the Census Bureau, the number of persons employed in the fisheries industries of the United States was 131,426, of whom 101,684 were fishermen, and the remainder shoresmen. The fishing fleet consisted of 6,605 vessels (with a tonnage of 208,297.82) and 44,804 boats, and the total amount of capital invested was $37,955,349, distributed as follows: Vessels, $9,357,282; boats, $2,465.393; minor apparatus and outfits, $8,145,261; other capital, including shore property, $17,987,413.

The value of the fisheries of the sea, the great rivers, and the great lakes was placed at $43,046,053, and that of those in minor inland waters at $1,500,000; in all, $44,546,053. These values were estimated upon the basis of the prices of the products received by the producers, and if average wholesale prices had been considered the value would have been much greater. In 1882 the yield of the fisheries was much greater than in 1880, and prices both "at first hand" and at wholesale were higher, so that a fair estimate at wholesale market rates would place their value at the present time rather above than below the sum of $100,000,000.

Since 1865 the fisheries have increased in extent and value to a degree without parallel in their previous history. Before the war of the rebellion (1861–'65) many of the fisheries which are now most important had no existence, and for four or five decades preceding only the oyster fishery, whale fishery, cod fishery, mackerel fishery, and shad and alewife fisheries were of any considerable importance. The recent increase is chiefly due (1) to the introduction of the improved methods of refrigeration, by means of which sea-fish are distributed widely throughout the interior of the country; (2) to greatly extended facilities for steam transportation; (3) to the extended introduction of methods of

packing in hermetically-sealed cans, and of more attractive methods of preparing for market the several kinds of dried and smoked fish; (4) to the introduction of improved vessels and apparatus by means of which the expense of capture has been greatly diminished; and (5) to the efforts of a considerable number of enthusiasts, anglers, statesmen, and philanthropists, who, by the organization of fishery societies, State fish commissions, and the United States Fish Commission, and by their publications, have awakened public interest, secured extensive appropriations of public money for the propagation and acclimatization of useful fishes, and have demonstrated the value to the country of many previously neglected fishery resources.

The fisheries of the New England States are the most important. They engage 37,043 men, 2,066 vessels, 14,787 boats, and yield products to the value of $14,270,393. In this district the principal fishing ports in order of importance are: Gloucester, Portland, Boston, Provincetown, and New Bedford, the latter being the center of the whale fishery. New England was settled in 1620 by colonists, chiefly from the western counties of England, who selected that portion of the coast on account of its peculiar fitness for the prosecution of the fisheries, and by the middle of the seventeenth century there was a considerable fleet of ketches and snows engaged in the cod fishery on the off-shore banks, where, especially on the banks of Newfoundland, France, Spain, Portugal, and England already had a fleet of several hundred large vessels. Just before the war of the revolution New England had 665 vessels and 4,405 men employed in its fisheries.

Next to New England in importance are the South Atlantic States, employing 52,418 men, 3,014 vessels (the majority of which are small and engaged in the shore and bay fisheries), 13,331 boats, and returning products to the value of $9,602,737.

Next are the Middle States, employing in the coast fisheries 14,981 men, 1,210 vessels, 8,293 boats, with products to the amount of $8,676,579.

Next are the Pacific States and Territories, with 16,803 men, 56 vessels, 5,547 boats, and products to the amount of $7,484,750. The fisheries of the Great Lakes employ 5,050 men, 62 vessels, and 1,594 boats, with products to the amount of $1,784,050. The Gulf States employ 5,131 men, 197 vessels, and 1,252 boats, yielding products to the value of $545,584.

Forty-three distinct fisheries are recognized by American writers, each being carried on in a special locality, and with methods peculiar

to itself. Among the most important of these are the oyster fishery, the off-shore cod fishery, the whale fishery, the fur-seal fishery, the mackerel fishery, the menhaden fishery, the halibut fishery, the antarctic seal and sea-elephant fishery, the west-coast salmon fishery, the lobster, the shad and alewife fishery, the swordfish fishery, and the clam fisheries.

The off-shore fisheries are carried on chiefly by citizens of the New England and Middle States, and are prosecuted on the great oceanic banks extending from Nantucket to Labrador, and upon the ledges and shoals between these and the coast.

The great purse-seine fisheries for mackerel and menhaden are carried on north of Cape Hatteras at distances from the shore varying from 1 mile to 150 miles. The fishing grounds in the Gulf of Saint Lawrence, formerly frequented by many hundreds of American vessels, have been entirely abandoned since the introduction of the purse-seine, and in 1882 only one vessel visited those waters, returning with about 200 barrels of mackerel. The oyster fishery is located for the most part between Cape Hatteras and Cape Cod, chiefly in the great inland bays. In all the great rivers of the Atlantic coast are fisheries for the anadromous shad and the two species of alewife. About the keys of Southern Florida is an extensive sponge fishery, and on the shoals of the Gulf of Mexico the red snapper and grouper fisheries are yearly increasing in value. The fur-seal fishery is chiefly located upon the Pribylov Islands of Alaska. A small fleet of vessels yearly penetrates to the ice-bound islands of the antarctic for seal-skins and sea-elephant oil. The whaling fleet, with headquarters at New Bedford and San Francisco, in the main frequent the North Pacific, though a number of smaller vessels, many of them from Provincetown, pursue the sperm whale in tropical waters. The salmon fishery is seated chiefly upon the Columbia River and its tributaries, though other rivers in Oregon and California produce large quantities of salmon, which is extensively "canned" and exported. The most valuable product of the Great Lake fisheries is the whitefish. The swordfish fishery of southern New England, though employing but 40 vessels, and perhaps 160 men, produces 1,500,000 pounds' weight annually.

The export of American fishery products is comparatively small, owing to the fact that the demand for such products for home consumption is really greater than the supply, and is constantly on the increase. In 1880 the total value of exported fish products amounted to $5,744,580,

of which, according to custom-house records, England received $2,601,-017. Of the quantity sent to England $1,596,007 was in canned preparations, and $363,790 in fresh oysters, the remainder being chiefly products of the whale fishery. In former years there was an extensive export trade in dried cod with Spain and Portugal, but this is now entirely abandoned. Large quantities of canned salmon are sent to China, Japan, and Australia.

At present no subsidies are allowed to fishermen, except that the duties on imported salt, used in the preparation of fish, are remitted. This practice was begun in 1863, at which time the old bounty law was repealed.

The United States, with the intention of aiding its fishermen, has paid to Great Britain the sum of $5,500,000 for the privilege of fishing in the British Provincial waters from 1873 to 1885.

Since 1871 the United States has appropriated over one million dollars to be used by the United States Fish Commission in behalf of the fishermen and fish consumers, and under the direction of the commissioner, Prof. Spencer F. Baird, very important results have been accomplished. All the State governments, with the exception of six, have established State fish commissions, and most of them have been liberally supported by grants of money.

The undeveloped fishery resources are very great. Many of the fishes and invertebrates which in Europe are highly valued by the poorer classes are never used here. Only about 150 of the 1,500 species of fishes known to inhabit the waters of the United States are ordinarily found in the markets.

An elaborate report upon the fishes and fisheries of the country in 1880 is now being published by the Government—the joint production of the Fish Commission and the Tenth Census.

G. BROWN GOODE.

LIST OF PERSONS ENGAGED IN THE PREPARATION OF THE COLLECTION.

SPENCER F. BAIRD,
United States Commissioner of Fish and Fisheries.
GEORGE BROWN GOODE,
Commisssioner to the Exhibition, in general charge.

COLLABORATORS IN FISH CULTURE.

THOMAS B. FERGUSON.....Assistant Commissioner of Fisheries, Washington.
MARSHALL MCDONALD.....Chief, Division of Propagation, U. S. Fish Commission, Washington.
CHARLES G. ATKINS.....Superintendent U. S. Salmon Hatcheries in Maine, Bucksport, Maine.
LIVINGSTON STONE.....Superintendent U. S. Salmon Hatchery in Sacramento River, California; Charlestown, New Hampshire.
FRANK N. CLARK.....Superintendent U. S. Whitefish Hatchery, Northville, Michigan.

GENERAL COLLABORATORS.

Hon. THOMAS DONALDSON.....Philadelphia, Pennsylvania.
EUGENE G. BLACKFORD.....New York Commissioner of Fisheries, New York City.
BARNET PHILLIPS.....Secretary American Fish Cultural Association, New York City.
W. A. WILCOX.....Secretary Boston Fish Bureau, Boston, Massachusetts.
A. R. CRITTENDEN.....Middletown, Connecticut.
JAMES G. SWAN.....Deputy Collector of Customs, Port Townsend, Washington Territory.

IN CHARGE OF SPECIAL COLLECTIONS.

Aquatic Mammals.—FREDERICK W. TRUE, Curator, Department of Mammals, U. S. National Museum.
Aquatic and Fish-eating Birds.—ROBERT RIDGWAY, Curator, Department of Birds, U. S. National Museum.
Aquatic Reptiles and Batrachians.—Dr. H. C. YARROW, Honorary Curator, Department of Reptiles, U. S. National Museum.
Fishes.—Dr. TARLETON H. BEAN, Curator, Department of Fishes, U. S. National Museum.
Mollusks.—Lieut. FRANCIS WINSLOW, U. S. N.

Aquatic Invertebrates, other than Mollusks.—RICHARD RATHBUN, Curator, Department of Invertebrates, U. S. National Museum.

Aquatic Plants.—Dr. W. G. FARLOW, Harvard University, Cambridge, Massachusetts.

Fishing-grounds and Scientific Research.—RICHARD RATHBUN, Curator, Department of Invertebrates, U. S. National Museum.

Apparatus of Sea and Fresh-water Fishing.—A. HOWARD CLARK, Assistant, Department of Art and Industry, U. S. National Museum.

Fishing Boats and Vessels and economic condition of Fishermen.—JOSEPH W. COLLINS, Division of Fisheries, U. S. Fish Commission.

Whaling and Sealing Apparatus.—JAMES TEMPLE BROWN, Assistant, Department of Art and Industries, U. S. National Museum.

Aboriginal Fishing Apparatus.—J. KING GOODRICH, Assistant, Department of Art and Industries, U. S. National Museum.

Products of the Fisheries.—A. HOWARD CLARK, Assistant, Department of Art and Industries, U. S. National Museum.

Fish Culture.—R. EDWARD EARLL, Division of Fisheries, U. S. Fish Commission.

Expert in Angling.—REUBEN WOOD, Syracuse, New York.

Disbursing Agent, U. S. Fish Commission.—HERBERT A. GILL, Washington.

Disbursing Agent for London Exhibition.—W. V. COX, Washington.

In charge of Packing and Installation.—HUBBARD C. CHESTER.

ARTISTS AND PREPARATORS.

Artist in Water Colors.—HENRY W. ELLIOTT.

Photographer.—T. W. SMILLIE, U. S. National Museum.

Artist in Crayon.—LEOPOLD MOELLER, Washington.

Artist in painting Casts.—A. ZENO SHINDLER, Artist, U. S. National Museum.

Taxidermy.—W. T. HORNADAY, HENRY MARSHALL, and F. A. LUCAS, Taxidermists, U. S. National Museum.

Modelers.—JOSEPH PALMER, WILLIAM PALMER, and J. E. HENDLEY, Modelers, U. S. National Museum.

Preparators.—E. H. HAWLEY, T. M. SWEENEY, and F. H. TOWNE, Preparators, U. S. National Museum.

Printer.—ALBERT CURET, Printer, U. S. National Museum.

A LIST OF SPECIAL EXHIBITORS.

[See Preliminary Catalogue, pp. 1–85.]

W. A. Abbe, New Bedford, Massachusetts.

Mayhew Adams, Chilmark, Massachusetts.

Alexander Agassiz, Museum of Comparative Zoology, Cambridge, Massachusetts.

Stephen H. Ainsworth, New York.

Alaska Commercial Company, San Francisco, California.

Albany Beef Packing Company, 372 Greenwich street, New York City.

Charles Alden, Randolph, Massachusetts.

F. S. Allen, New Bedford, Massachusetts.

Frederick S. Allen, Cuttyhunk, Massachusetts.

J. A. Allen, Museum of Comparative Zoology, Cambridge, Massachusetts.

The American Angler, New York City.

The American Field, Western office 155 and 157 Dearborn street, Chicago, Illinois.

American Fish-Cultural Association, New York City.

American Net and Twine Company, Boston, Massachusetts.

American Ship Windlass Company, Providence, Rhode Island.

Max Ams, 372 and 374 Greenwich street, New York City.

James Annin, jr., Caledonia, New York.

Charles G. Atkins, Bucksport, Maine.

Atwood Brothers, Clayton, New York.

Badollet & Co., and Tillamook Packing Company, Astoria, Oregon.

Bagnall & Loud, Boston, Massachusetts.

Arthur H. Bailey & Co., Boston, Massachuetts.

Passed Assistant Engineer William L. Bailie, U. S. N., Steamer Fish-Hawk.

Benjamin Baker, 2d, New Bedford, Massachusetts.

J. H. Bartlett & Sons, New Bedford, Massachusetts.

John Bartlett, Cambridge, Massachusetts.

James Barton, New Bedford, Massachusetts.

Tarleton H. Bean, United States National Museum, Washington.

J. W. Beardsley's Sons, 179 West street, New York City.

James Beetle, New Bedford, Massachusetts.

Rudolphus Beetle, New Bedford, Massachusetts.

J. E. Benedict, United States Steamer Albatross.

Eugene G. Blackford, New York Fish Commissioner, Fulton Market, New York City.
John Bliss & Co., New York City.
A. Booth, Baltimore, Maryland; Chicago, Illinois; and Astoria, Oregon.
Jonathan Bourne, New Bedford, Massachusetts.
E. A. Brackett, Winchester, Massachusetts.
Walter M. Brackett, Boston, Massachusetts.
Junius A. Brand, Norwich, Connecticut.
James D. Brewer, Muncy, Pennsylvania.
James Temple. Brown, United States National Museum, Washington.
Brush Swan Electric Light Company, New York City.
Oliver N. Bryan, Occokeek, Maryland.
Burnham & Morrill, Portland, Maine.
J. T. Buttrick, New Bedford, Massachusetts.
Charles Carpenter, Kelley's Island, Ohio.
Castine Packing Company, Castine, Maine.
The Century Company, New York City, Art Department, A. W. Drake, Superintendent.
A. J. Chase, Boston, Massachusetts.
Oren M. Chase, Detroit, Michigan.
Captain H. C. Chester, Noank, Connecticut.
A. Howard Clark, United States National Museum, Washington.
Frank N. Clark, Northville, Michigan.
James B. Clark, Chester, Connecticut.
Henry Clay, New Bedford, Massachusetts.
J. W. Coffin, Edgartown, Massachusetts.
Charles A. Cole, Scituate, Massachusetts.
Luther Cole, New Bedford, Massachusetts.
A. S. Collins, Caledonia, New York.
Captain J. W. Collins, Gloucester, Massachusetts.
Paul E. Collins, Boston, Massachusetts.
Captain B. F. Conklin, Jamesport, New York.
D. Connell, Provincetown, Massachusetts.
Conroy & Bissett, 65 Fulton street, New York City.
Captain Caleb Cook, Provincetown, Massachusetts.
H. & S. Cook & Co., Provincetown, Massachusetts.
N. N. Cook, Provincetown, Massachusetts.
Stephen Cook, Provincetown, Massachusetts.
Patrick Cunningham, New Bedford, Massachusetts.
Cutting Packing Company, San Francisco, California.
Captain W. H. Dall, United States Coast Survey, Washington.
Frank E. Davis, Gloucester, Massachusetts.
De Butts & Daggetts, Boston, Massachusetts.
W. G. Delawder, Easton, Maryland.
A. W. Dodd & Co., Gloucester, Massachusetts.
J. T. Dunnell, Bath, Maine.
J. W. Dresser, Castine, Maine.
Benjamin F. Drew, Fairhaven, Massachusetts.

James D. Driggs, New Bedford, Massachusetts.
Winfield S. Dunan, Baltimore, Maryland.
R. Edward Earll, Washington, District of Columbia.
Selmar Eggers, sr., New Bedford, Massachusetts.
Selmar Eggers, jr., New Bedford, Massachusetts.
Henry W. Elliott, Washington, District of Columbia.
Henry W. Elliott and J. W. Collins.
J. H. Emerton, Peabody Museum, Yale College, New Haven, Connecticut.
F. M. Everleth, Waldoboro', Maine.
James L. Everson, Williamsburg, New York.
Fairbanks & Co., New York City.
Prof. W. G. Farlow, Harvard College, Cambridge, Massachusetts.
Walter Faxon, Museum of Comparative Zoology, Cambridge, Massachusetts.
Albert Ferguson, 65 Fulton street, New York City.
Major T. B. Ferguson, Assistant United States Fish Commissioner, Washington, District of Columbia.
J. Walker Fewkes, Museum of Comparative Zoology, Cambridge, Massachusetts.
Forest and Stream Publishing Company, 39 and 41 Park Row, New York City.
Al. Foster, New York City.
Mrs. Capt. J. H. Freeman, Wellfleet, Massachusetts.
Fulton Market Fish-Mongers' Association, New York City.
Mrs. E. A. Gannett, Edgartown, Massachusetts.
John D. S. Giles, Brig "George and Mary."
Gloucester Isinglass and Glue Company, Gloucester, Massachusetts.
Monroe A. Green, Mumford, Monroe County, New York.
Seth Green, Rochester, New York.
Oscar Harger, Peabody Museum, Yale College, New Haven, Connecticut.
Haven, Williams & Co., New London, Connecticut.
William P. Haywood, West Creek, Ocean County, New Jersey.
J. W. Hendley, United States National Museum, Washington, District of Columbia.
Higgins & Gifford, Gloucester, Massachusetts.
J. E. Hilgard, Superintendent United States Coast and Geodetic Survey.
L. S. Hill & Co., Grand Rapids, Michigan.
Hine & Co., 13 and 15 Doyers street, New York City.
Wakeman Holberton, 65 Fulton street, New York City.
Frank Holmes, Chagrin Falls, Ohio.
Marshall H. Holmes, 226 N. Fourth street, Philadelphia, Pennsylvania.
William J. Hooper Sons (Baltimore Twine and Net Company), Baltimore, Maryland.
W. T. Hornaday, United States National Museum, Washington, District of Columbia.
William Hume, Astoria, Oregon.
Ichthyophagous Club, New York City.
Thomas A. Irving, Provincetown, Massachusetts.
Prof. David S. Jordan, Indiana University, Bloomington, Indiana.

Daniel Kelleher, New Bedford, Massachusetts.
George Knowles, Provincetown, Massachusetts.
John P. Knowles, 2d, New Bedford, Massachusetts.
Thomas Knowles & Co., New Bedford, Massachusetts.
Lawrence & Co., New London, Connecticut.
William Lewis, New Bedford, Massachusetts.
W. K. Lewis & Brothers, Boston, Massachusetts.
W. N. Lockington, Philadelphia, Pennsylvania.
Loomis, Plumb & Co., Syracuse, New York.
H. & G. W. Lord, Boston, Massachusetts.
David W. Low, Gloucester, Massachusetts.
F. A. Lucas, United States National Museum, Washington, District of Columbia.
John McCullough, New Bedford, Massachusetts.
Marshall McDonald, Washington, District of Columbia.
H. D. McGovern, Brooklyn, New York.
McKesson & Robbins, 91 Fulton street, New York City.
McMenamin & Co., Hampton, Virginia.
Mackey & Pindar, New Bedford, Massachusetts.
Joseph B. Macy, Nantucket, Massachusetts.
H. J. Mahrenholz, New York City.
Mann Bros., Chicago, Illinois.
John Mann & Co., Syracuse, New York.
C. B. Marchant, Edgartown, Massachusetts.
Henry Marshall, United States National Museum, Washington, District of Columbia.
H. W. Mason, New Bedford, Massachusetts.
Massachusetts Humane Society.
Fred. Mather, New York City.
Henry Mayo & Co., Boston, Massachusetts.
George Merchant, jr., Gloucester, Massachusetts.
B. C. Milam, Frankfort, Kentucky.
The George W. Miles Company, Milford, Connecticut.
The Miller Berth and Life-Saving Mattress Company, Boston, Massachusetts. Capt. Benj. F. Flinn, Agent.
William Mills & Son, 7 Warren street, New York City.
William Mitchell, 26 Vandam street, New York City.
Museum of Comparative Zoology, Cambridge, Massachusetts.
Chresten Nelsen, Gloucester, Massachusetts.
New Bedford Cordage Company, J. W. Macomber, agent, New Bedford, Massachusetts.
B. F. Nichols, Boston, Massachusetts.
Nickerson & Baxter, Boston, Massachusetts, agents for J. W. Court & Co.
John W. Norton, Edgartown, Massachusetts.
Old Colony Mills, Plymouth, Massachusetts.
Oregon Packing Company, J. W. and V. Cook, proprietors, Portland, Oregon.
James C. Osborne, Edgartown, Massachusetts.
Samuel Osborne, jr., & Sons, Edgartown, Massachusetts.

N. A. Osgood, Battle Creek, Michigan.
H. D. Ostermoor & Son, 36 Broadway, New York City.
A. S. Packard, jr., Providence, Rhode Island.
Thomas B. Paddock, Nantucket, Massachusetts.
E. W. Page & Co., 69 West street, New York City.
Joseph Palmer, United States National Museum, Washington, District of Columbia.
Joel C. Parker, Grand Rapids, Michigan.
William B. Parsons, Rockport, Massachusetts.
Thomas M. Peakes, Edgartown, Massachusetts.
Perkins & Shurtleff, Portland, Maine.
Barnet Phillips, New York City.
William Phillips & Son, New Bedford, Massachusetts.
L. Pickert & Co., Boston, Massachusetts.
Henry T. Picking, Commander, U. S. N., Naval Secretary, Washington, District of Columbia.
Capt. Eben Pierce, New Bedford, Massachusetts.
R. G. Pike, Middletown, Connecticut.
Portland Packing Company, Portland, Maine.
Potter & Wrightington, Boston, Massachusetts.
Edward Potts, Philadelphia, Pennsylvania.
Procter Brothers, Gloucester, Massachusetts.
G. W. Proctor, San Miguel, California.
Jasper Pryer, 143 Front street, New York City.
F. W. Putnam, Cambridge, Massachusetts.
James Quinn, Quinnis, Oregon.
Quinnipiac Fertilizer Company, New London, Connecticut.
Richard Rathbun, United States National Museum, Washington.
Dr. Charles Rau, United States National Museum, Washington.
C. Recht, 183 Bowery, New York City.
George Ricardo, Hackensack, New Jersey.
Nathan Richardson, Gloucester, Massachusetts.
Ridgway Refrigerator Company (limited), Philadelphia, Pennsylvania.
Robert Ridgway, United States National Museum, Washington.
Prof. C. V. Riley, Department of Agriculture, Washington.
William Roberts, Provincetown, Massachusetts.
G. S. Robinson, Fairhaven, Massachusetts.
Wm. S. Robinson & Co., New Haven, Connecticut.
Rosenstein Brothers, 323 Greenwich street, New York City.
Russell Mills Company, Plymouth, Massachusetts, N. Boynton & Co., agents, Boston, Massachusetts.
Russia Cement Company, Gloucester, Massachusetts.
John A. Ryder, United States Fish Commission, Washington.
John A. Sawyer, New Bedford, Massachusetts.
Charles M. Scammon, captain United States Revenue Marine.

S. Schmidt & Bro., New York City.
Charles Scribner's Sons, New York City.
Sea World Publishing Company, W. B. Hopson, manager and editor, Baltimore, Maryland.
Henry Sellman, Camden, Maine. (Union Fish Company.)
Sewall, Day & Co., Boston, Massachusetts.
B. F. Shaw, Anamosa, Iowa.
A. Zeno Shindler, United States National Museum.
A. B. Shipley & Sons, Philadelphia, Pennsylvania.
F. H. Siewerd & Brother, Baltimore, Maryland.
Commander Charles D. Sigsbee, United States Navy, Washington.
James M. Simms, Gloucester, Massachusetts.
I. A. Small, Provincetown, Massachusetts.
C. W. Smiley, United States Fish Commission, Washington.
T. W. Smillie, Photographer, United States National Museum, Washington, District of Columbia.
Everett Smith, Portland, Maine.
Seth Smith, Provincetown, Massachusetts.
Smithsonian Institution, Washington, Spencer F. Baird, Secretary.
Loum Snow & Son, New Bedford, Massachusetts.
Soluble Pacific Guano Company, Wood's Holl, Massachusetts.
Henry O. Stanley, Dixfield, Maine.
Silas Stearns, Pensacola, Florida.
E. M. Stillwell, Bangor, Maine.
Livingston Stone, Charlestown, New Hampshire.
James G. Swan, Port Townsend, Washington Territory.
Jireh Swift, New Bedford, Massachusetts.
Lieut. Z. L. Tanner, U. S. N., U. S. Steamer Albatross.
Tarr & Wonson, Gloucester, Massachusetts.
James H. Tarr, Gloucester, Massachusetts.
James Taylor and James V. Cox, New Bedford, Massachusetts.
Thomas Taylor, New Berne, North Carolina.
William Taylor, Portland, Maine.
S. Thaxter & Son, Boston, Massachusetts.
John H. Thompson, New Bedford, Massachusetts.
Tiffany & Co., New York City and Paris.
H. L. Todd, draughtsman, United States Fish Commission, Washington.
A. J. Tower, Boston, Massachusetts.
United States Albumen Manufacturing Company, Osterville, Massachusetts (Uno G. Hillman, superintendent).
United States Beacon Light and Signal Company, Philadelphia, Pennsylvania.
United States Department of the Interior.
United States Department of the Navy.
United States Department of the Treasury.
United States Department of War.
United States National Museum, Spencer F. Baird, director, Washington.
Van Altena & Scheltus, Milwaukee, Wisconsin.

Prof. A. E. Verrill, Yale College, New Haven, Connecticut.

Adolph Voss, Gloucester, Massachusetts.

O. C. Voss, Gloucester, Massachusetts.

Dr. C. A. White, United States Geological Survey, Washington.

Wilcox, Crittenden & Co., Middletown, Connecticut.

W. A. Wilcox, Secretary Boston Fish Bureau, Boston, Massachusetts.

C. A. Williams, New London, Connecticut.

J. & W. R. Wing, New Bedford, Massachusetts.

Lieut. Francis Winslow, United States Navy, United States Fish Commission, Washington.

Wolff & Riesing, Eastport, Maine

George Woltz, Washington.

Everett P. Wonson, Gloucester, Massachusetts.

Lieut. Wood, United States Navy, United States Steamer Fish Hawk.

Reuben Wood, Syracuse, New York.

Woodbury Mills, Baltimore, Maryland.

James Worrall, Columbia, Pennsylvania.

Isaac H. Wright, Baltimore, Maryland.

William G. Wroten, Maryland.

John Wyeth & Brother, Philadelphia, Pennsylvania.

STATISTICS OF THE FISHERIES OF THE UNITED STATES IN 1880.

[From the Compendium of the Tenth Census.]

	STATES AND TERRITORIES.	GRAND TOTAL.			PERSONS EMPLOYED.		APPARATUS AND CAPITAL.							VALUE OF PRODUCTS BY FISHERIES.						
							Vessels.			Boats.		Value of minor apparatus and outfits.	Other capital, including shore property.							
		Persons employed.	Capital invested.	Value of products.	Fishermen.	Shoresmen.	Number.	Tonnage.	Value.	Number.	Value.			General fisheries.	Whale fishery.	Seal fishery.	Menhaden fishery.	Oyster fishery.	Sponge fishery.	Marine salt industry.	
		Number.			*Number.*	*Number.*														
	The United States	131,426	$37,955,349	$43,046,053	101,684	29,742	6,605	208,297.82	$9,357,282	44,804	$2,465,393	$8,145,261	$17,987,413	$22,405,018	$2,323,943	$2,289,813	$2,116,787	$13,404,852	$200,750	$505,890	
	New England States	37,043	19,937,607	14,270,393	29,838	7,205	2,066	113,602.59	4,562,131	14,787	739,970	5,038,171	9,597,335	10,014,645	2,121,385	111,851	539,752	1,478,900		3,890	
	Middle States, exclusive of Great Lake fisheries	14,981	4,426,078	8,676,579	12,584	2,397	1,210	23,566.93	1,382,000	8,293	546,647	674,951	1,822,480	2,882,294			1,261,385	4,532,900			
	Southern Atlantic States	52,418	8,951,722	9,602,737	38,774	13,644	3,014	60,886.15	2,375,450	13,331	640,508	1,145,878	4,789,886	2,217,797	408		315,680	7,068,852			
	Gulf States	5,131	545,584	1,227,544	4,382	749	197	3,009.86	308,051	1,252	50,173	52,823	134,537	713,594				313,200	200,750		
	Pacific States and Territories	16,803	2,748,383	7,484,750	11,613	5,190	56	5,463.42	546,450	5,547	404,095	467,238	1,330,000	4,792,638	202,150	2,177,962		10,000		302,000	
	Great Lakes	5,050	1,345,975	1,784,050	4,493	557	62	1,768.87	183,200	1,594	83,400	766,200	313,175	1,784,050							
1	Alabama	635	38,200	119,275	545	90	24	317.20	14,585	119	10,215	7,000	6,400	74,325				44,950			1
2	Alaska	6,130	447,000	2,661,640	6,000	130				3,000	60,000	7,000	380,000	564,640	500	2,096,500					2
3	California	3,094	1,139,675	1,860,714	2,089	1,005	49	5,246.80	535,350	853	91,485	205,840	307,000	1,341,314	201,650	15,750				302,000	3
4	Connecticut	3,131	1,421,020	1,456,866	2,585	546	291	9,215.95	514,050	1,173	73,585	375,535	457,850	383,887	32,048	111,851	256,205	672,875			4
5	Delaware	1,979	268,231	997,695	1,662	317	69	1,226.00	51,600	839	33,227	76,324	113,080	309,029			941	687,725			5
6	Florida	2,480	406,117	643,227	2,284	196	124	2,152.97	272,645	1,058	28,508	39,927	65,037	426,527				15,950	200,750		6
7	Georgia	899	78,770	119,993	809	90	1	12.00	450	358	15,425	18,445	44,450	84,993				35,000			7
8	Illinois	300	83,400	60,100	265	35	3	209.73	8,500	101	2,000	11,900	61,000	60,100							8
9	Indiana	52	29,360	32,740	45	7	1	21.90	2,500	15	1,650	20,210	5,000	32,740							9
10	Louisiana	1,597	93,621	392,610	1,300	297	49	539.69	20,821	165	4,800	18,000	50,000	192,610				200,000			10
11	Maine	11,071	3,375,994	3,614,178	8,110	2,961	606	17,632.65	633,542	5,920	245,624	934,593	1,562,235	3,576,678				37,500			11
12	Maryland	26,008	6,342,443	5,221,715	15,873	10,135	1,450	43,500.00	1,750,000	2,825	186,448	297,145	4,108,850	479,388			11,851	4,730,476			12
13	Massachusetts	20,117	14,334,450	8,141,750	17,165	2,952	1,054	83,232.17	3,171,189	6,749	351,736	3,528,925	7,282,600	5,581,204	2,089,337		61,769	405,550		3,890	13
14	Michigan	1,781	442,665	716,170	1,600	181	36	914.42	98,500	454	10,345	272,920	60,900	716,170							14
15	Minnesota	35	10,160	5,200	30	5	1	33.59	5,000	10	900	3,760	500	5,200							15
16	Mississippi	186	8,800	22,540	110	76				58	4,600	1,600	2,600	12,540				10,000			16
17	New Hampshire	444	209,465	176,684	376	38	23	1,019.05	51,500	211	7,780	60,385	89,800	170,634				6,050			17
18	New Jersey	6,220	1,492,202	3,176,589	5,659	561	590	10,445.90	545,900	4,065	223,963	232,339	490,000	949,678			146,286	2,080,625			18
19	New York	7,266	2,629,585	4,380,565	5,650	1,616	541	11,582.51	777,600	3,441	289,885	390,200	1,171,500	1,689,357			1,114,158	1,577,050			19
20	North Carolina	5,274	506,561	845,695	4,729	545	95	1,457.90	39,000	2,714	123,175	225,436	118,950	785,287	408			60,000			20
21	Ohio	1,046	473,800	518,420	925	121	9	359.51	38,400	487	29,830	253,795	151,775	518,420							21
22	Oregon	6,835	1,131,350	2,781,024	2,795	4,040				1,360	246,600	245,750	639,000	2,776,724		4,300					22
23	Pennsylvania	552	119,810	320,050	511	41	11	321.99	10,500	156	13,272	40,538	55,500	132,550				187,500			23
24	Rhode Island	2,310	596,678	880,915	1,602	708	92	2,502.77	191,850	734	61,245	138,733	204,850	302,242			221,748	356,925			24
25	South Carolina	1,005	66,275	212,482	964	41	22	337.32	15,000	501	9,790	25,985	15,500	192,482				20,000			25
26	Texas	601	42,400	128,300	491	110				167	15,000	4,400	23,000	81,000				47,300			26
27	Virginia	18,864	1,914,119	3,124,444	16,051	2,813	1,446	15,578.93	571,000	6,618	292,720	560,763	489,636	602,239			303,829	2,218,376			27
28	Washington	744	30,358	181,372	729	15	7	216.62	11,100	334	6,610	8,648	4,000	109,960		61,412		10,000			28
29	Wisconsin	800	222,840	253,100	730	70	11	220.25	26,700	319	24,975	145,165	26,000	253,100							29

2444——Face p. xx.

F THE UNITED STATES IN

of the Tenth Census.]

PARATUS AND CAPITAL.

	Boats.		Value of minor apparatus and outfits.	Othe in sh er
	Number.	Value.		
82	44, 804	$2, 465, 393	$8, 145, 261	$
31	14, 787	739, 970	5, 038, 171	
00	8, 293	546, 647	674, 951	
50	13, 331	640, 508	1, 145, 878	
51	1, 252	50, 173	52, 823	
50	5, 547	404, 695	467, 238	
00	1, 594	83, 400	766, 200	
85	119	10, 215	7, 000	
---	3, 000	60, 000	7, 000	
50	853	91, 485	205, 840	
50	1, 173	73, 585	375, 535	
00	839	33, 227	78, 324	
45	1, 058	28, 508	39, 927	
50	358	15, 425	18, 445	
00	101	2, 000	11, 900	
00	15	1, 650	20, 210	
21	165	4, 800	18, 000	
42	5, 920	245, 624	934, 593	
00	2, 825	186, 448	297, 145	
89	6, 749	351, 736	3, 528, 925	
00	454	10, 345	272, 920	
00	10	900	3, 760	
----	58	4, 600	1, 600	
00	211	7, 780	60, 385	
00	4, 065	223, 963	232, 339	
00	3, 441	289, 885	390, 200	
00	2, 714	123, 175	225, 436	
00	487	29, 830	253, 795	
----	1, 360	246, 600	245, 750	
00	156	13, 272	40, 538	
50	734	61, 245	138, 733	
00	501	9, 790	25, 985	
----	167	15, 000	4, 400	
00	6, 618	292, 720	560, 763	
00	334	6, 610	8, 648	
00	319	24, 975	145, 165	

PROVISIONAL LIST OF SUCCESSFUL AMERICAN COMPETITORS AT THE INTERNATIONAL FISHERIES EXHIBITION, LONDON, 1883.

Corrected to March 28, 1884.

A.—GOLD MEDALS.

1. U. S. Fish Commission, for collective exhibit of primitive and modern fishing gear.
2. U. S. Fish Commission, for collection of boat models.
3. U. S. Fish Commission, for collective exhibit of fish.
4. U. S. Fish Commission, for collective exhibit of fish, whale, and seal oils.
5. U. S. Fish Commission, for best and most complete collection of fish-cultural apparatus.
6. U. S. Fish Commission, for general collection of apparatus used in the preparation of fishery products.
7. U. S. Fish Commission, for collection of rigged models of fishing vessels.
8. U. S. Fish Commission, for collection of builder's models of fishing vessels.
9. U. S. Fish Commission, for collective exhibit of apparatus for deep sea explorations.
10. U. S. Fish Commission, for collective exhibit of casts and stuffed specimens of seals, porpoise, fish-eating birds, &c.
11. U. S. Fish Commission, for collective exhibit of artificial flies for salmon, trout, &c.
12. U. S. Fish Commission, for collective exhibit of large photographs illustrative of the fisheries.
13. U. S. Fish Commission, for collective exhibit of casts.
14. U. S. Fish Commission, for general exhibit of publications relating to the fisheries.
15. U. S. Fish Commission, for models and drawings of American purse-seine.
16. U. S. Fish Commission, for exhibit of whalebone.
17. U. S. Fish Commission, for models of menhaden oil and guano establishment.
18. U. S. Fish Commission, for model of lobster establishment.
19. U. S. National Museum, for collective exhibit of fishes.

20. U. S. Signal Service, for most complete collection of apparatus for weather prediction.
21. U. S. Light-House Board, for models and drawings of light-houses and apparatus relating to same.
*22. U. S. Life-Saving Service, for collective exhibit of life-saving apparatus.
23. Prof. J. E. Hilgard, Washington, for optical densimeter.
24. Capt. C. D. Sigsbee, U. S. N., Annapolis, for deep-sea sounding paratus.
25. Potter & Wrightington, Boston, Massachusetts, for mackerel in brine.
26. B. S. Snow & Co., Boston, Massachusetts, for boneless codfish.
27. L. Pickert & Co., Boston, Massachusetts, for compressed codfish.
28. William Mills & Son, New York City, for collective exhibit of fishing rods.
29. William Mills & Son, New York City, for Leonard trout rod.
30. Marshall McDonald, Washington, the salmon ladder.
31. American Net and Twine Company, Boston, Massachusetts, for collection of nets.
32. I. H. Bartlett & Sons, New Bedford, Massachusetts, for whale-boat fully equipped for use.
33. John Bliss & Co., New York City, for chronometer.
34. H. D. Ostermoor & Son, New York City, for life-saving mattress.
35. U. S. Beacon Light and Signal Company, Philadelphia, Pennsylvania, for compressed gas beacon.
36. Russia Cement Company, Gloucester, Massachusetts, for fish glue.
37. H. W. Mason, New Bedford, Massachusetts, for explosive harpoon.
38. J. W. Beardsley's Sons, New York City, for dry-salted codfish.
39. Charles Alden, Randolph, Massachusetts, for evaporated and boneless codfish.
40. Capt. Eben Pierce, New Bedford, Massachusetts, for improved gun lance and harpoon.
41. Junius A. Brand, Norwich, Connecticut, for whale gun and bomb-lance.
42. Thomas A. Irving, Gloucester, Massachusetts, for model of three-masted fishing schooner.
43. Old Colony Mills, Plymouth, Massachusetts, for canvas used on fishing vessels.
44. J. & H. J. Green, New York City, for barometers, thermometers, &c.
45. W. L. Bailie, P. A. Engr., U. S. N., for deep-sea thermometer case.
46. A. W. Dodd & Co., Gloucester, Massachusetts, for cod liver emulsion.
*47. Prof. Alex. Agassiz, Cambridge, for work on ichthyology.
*48. Prof. G. Brown Goode, Washington, for work on ichthyology.
*49. Prof. D. S. Jordan, Bloomington, Indiana, for work on ichthyology.
*50. M. J. Burns, for drawings for wood engravings.

---

* Additions to first list.

B.—SILVER MEDALS.

51. U. S. Fish Commission, for exhibits of dredges.
52. U. S. Fish Commission, for apparatus for the manufacture of fishery products.
53. U. S. Fish Commission, for model of car for the transportation of young fish.
54. U. S. Fish Commission, for collection of large photographs illustrative of fish culture.
55. Prof. G. Brown Goode, Washington, for publication relating to the fisheries.
56. Capt. J. W. Collins, Gloucester, Massachusetts, for fog horn.
57. Capt. J. W. Collins, Gloucester, Massachusetts, for marine drag.
58. Marshall McDonald, Washington, for universal hatching jar.
59. Lieut. Z. L. Tanner, U. S. N., for deep sea sounding apparatus.
60. Prof. W. G. Farlow, Cambridge, Massachusetts, for collection of marine algæ.
61. Alaska Commercial Company, San Francisco, California, for collection of seal skins.
62. Tiffany & Co., New York City, for alligator goods.
63. B. F. Nicholas, Boston, Massachusetts, for general exhibit of trout and salmon rods.
64. Wm. Mitchell, New York City, for general exhibit of fishing rods.
65. Wm. Mills & Son, New York City, for Leonard salmon rods.
66. B. F. Nichols, Boston, Massachusetts, for salmon rods.
67. B. F. Nichols, Boston, Massachusetts, for trout rods.
68. Higgins & Gifford, Gloucester, Massachusetts, for model of seine-boat.
69. Higgins & Gifford, Gloucester, Massachusetts, for surf life-boat.
70. John Bliss & Co., New York City, for patent taffrail log.
71. McMenamin & Co., Hampton, Virginia, for general exhibit of canned oysters and crabs.
72. Potter & Wrightington, Boston, Massachusetts, for general exhibit of canned goods.
73. Oregon Packing Company, Portland, Oregon, for general exhibit of canned fish.
74. J. G. Megler & Co., Brookfield, Washington Territory, for salmon in cans.
75. Burnham & Morrill, Portland, Maine, for exhibit of fishery products in tins.
76. H. & G. W. Lord, Boston, Massachusetts, for cotton netting.
77. Nickerson & Baxter, Boston, Massachusetts, for collection of sea. fish hooks.
78. J. T. Donnell, Bath, Maine, for manila cable.
79. New Bedford Cordage Company, New Bedford, Massachusetts, for manila rope.

80. Woodbury Mills, Baltimore, Maryland, for canvas.
81. Russell Mills Company, Plymouth, Massachusetts, for samples of canvas for sails.
82. Chresten Nelson, Gloucester, Massachusetts, for preservatives for ropes and canvas.
83. J. W. Beardsley's Sons, New York City, for shredded salt cod and smoked herring.
84. Perkins & Shurtleff, Portland, Maine, for compressed codfish.
85. L. Pickert & Co., Boston, Massachusetts, for boneless smoked herring.
86. Albany Beef Packing Company, New York, for canned sturgeon, &c.
87. A. Booth, Baltimore and Chicago, for oysters in glass, oysters in tin, and canned salmon.
88. S. Schmidt & Bro., New York City, for eels in jelly.
89. Rosenstein Brothers, New York City, for canned lobsters and general exhibit.
90. Henry Sellman, Camden, Maine, for model of sardine cannery.
91. A. W. Dodd & Co., Gloucester, Massachusetts, for fish oils.
92. The George W. Miles Company, Milford, Connecticut, for menhaden oil.
93. Gloucester Isinglass and Glue Company, Gloucester, Massachusetts, for fish glue.
94. Frank N. Clark, Northville, Michigan, for hatching apparatus for adhesive fish eggs.
95. J. H. Emerton, New Haven, Connecticut, for model of squid and octopus.
96. Dr. T. H. Bean, Washington, for works on ichthyology.
97. Marshall McDonald, Washington, for map showing shad fisheries.

C.—BRONZE MEDALS.

98. Capt. H. C. Chester, Noank, Connecticut, for lobster boat and fishing ketch.
99. Capt. H. C. Chester, Noank, Connecticut, for mechanical hatching box.
100. James M. Simms, Gloucester, for rigging.
101. M. F. Whitton & Co., Boston, for manila cable.
102. Bagnall & Loud, Boston, for snatch block.
103. Conroy & Bisset, New York, for general exhibit of fishing tackle.
104. Conroy & Bisset, New York, for salmon rods.
105. Conroy & Bisset, New York, for trout rods.
106. J. H. Mann & Co., for general exhibit of fishing tackle.
107. Wm. Mitchell, New York, for salmon rods.
108. Wm. Mitchell, New York, for trout rods.
109. Winans & Whistler, Baltimore, for reels.

110. Loomis, Plumb & Co., Syracuse, for reels.
111. James B. Clark, Chester, Connecticut, for rudder.
112. Frank Holmes, Chagrin Falls, Ohio, for portable boat.
113. Max Ams, New York, for general exhibit of prepared fish.
114. Cutting Packing Company, San Francisco, for general exhibit of prepared fish.
115. Hine & Co., New York, for general exhibit of prepared fish.
116. W. K. Lewis & Bros., Boston, for general exhibit of canned goods.
117. Henry Mayo & Co., Boston, for general exhibit of fishery products.
118. L. Pickert & Co., Boston, for general exhibit of fishery products.
119. Wolff & Reessing, Eastport, for general exhibit of canned goods.
120. The Geo. W. Miles Company, Milford, Connecticut, for fish guano.
121. W. S. Robinson & Co., New Haven, Connecticut, for fresh-oyster conveyances.
122. Marcellus C. Holton, Rochester, New York, for hatching-box for salmonidæ.
123. Mr. Seymour Bower, Northville, Michigan, for trough for semi-buoyant eggs.
124. E. M. Stillwell, Bangor, Maine, for aereating pump.
125. Edward Potts, Philadelphia, for collection of sponges.
126. McKesson & Robbins, New York, for sponge exhibit.
127. W. Brackett, Boston, for still-life pictures.

D.—DIPLOMAS.

128. U. S. Fish Commission, for mackerel and herring nets.
129. A. J. Chase, Boston, for cold-blast refrigerator.
130. H. & S. Cook & Co., Provincetown, for model of schooner.
131. Sewall, Day & Co., Boston, Mass., for rope.
132. Lawrence Mills, M. F. Whitton & Co., Boston, for canvas.
133. Wilcox, Crittenden, & Co., Middletown, for boat fittings.
134. Prof. J. E. Hilgard, Washington, for salinometer.
135. Capt. C. D. Sigsbee, U. S. N., for parallel ruler.
136. J. E. Benedict, U. S. N., for rake dredge.
137. A. B. Shipley & Son, Philadelphia, for general exhibit fishing tackle.
138. N. A. Osgood, Battle Creek, Michigan, for portable boat.
139. Max Ams, New York City, for American caviare.
140. S. Schmidt & Bro., New York City, for smoked fish.
141. Arthur H. Bailey & Co., Boston, for general exhibit prepared fish.
142. Winfield S. Dunan, Baltimore, for menhaden oil.
143. B. H. Steinmetz & Son, Washington, for beaver skins, &c.
144. H. J. Mahrenholz, New York City, for alligator skins.
145. McKesson & Robbins, New York City, for collection Florida sponges.
146. Charles G. Atkins, Bucksport, Maine, for eggs and young of salmon.

147. Frank N. Clark, Northville, Michigan, for ova, &c.
148. R. E. Earll, Washington, for codfish eggs.
149. Marshall McDonald, Washington, for eggs and fry of trout.
150. Livingston Stone, Charlestown, N. H., for eggs and young fish showing development, California salmon.
151. Lieut. W. M. Wood, U. S. N., for apparatus for lowering boats.

DIPLOMAS OF HONOR.

152. Prof. Spencer F. Baird, for special services rendered (found among special prizes).
153. Prof. G. Brown Goode, for special services rendered.
154. Tarleton H. Bean, for special services rendered.
155. Marshall McDonald, for special services rendered.
156. Capt. J. W. Collins, for special services rendered.
157. R. Hitchcock, for special services rendered.
158. Lieut. Francis Winslow, U. S. N., for special services rendered.
159. The Hon. Edward Meigs Smith, New York, for special services rendered.
160. William V. Cox, for special services rendered.
161. Max Hansmann, for special services rendered.
162. Lieut. Charles H. McLellan, Tom's River, New Jersey, U. S. R. M., for special services rendered.
163. Sergeant James Mitchell, U. S. Army, for special services rendered.
164. Richard Rathbun, for special services rendered.
165. R. Edward Earll, for special services rendered.
166. E. T. Russell, Boston, for special services rendered.
167. A. Howard Clark, for special services rendered.
168. Reuben Wood, Syracuse, New York, for special services rendered.
169. Hon. James Russell Lowell, for special services rendered.
170. Randolph F. Geary, for special services rendered.

E.—SPECIAL MONEY PRIZES.

171. B. F. Nichols, Boston, Massachusetts, £10 for collection salmon rods.
172. William Mills & Son, New York City, £5 for collection split cane rods.
173. William Mills & Son, New York City, £10 for collection trout lines.
174. U. S. Fish Commission, £10 for collection of dry-salted fish.
175. F. N. Clark, Northville, Michigan, £5 for best coarse fish-hatching apparatus.
176. H. C. Chester, Noank, Connecticut, £5 for best apparatus for hatching eggs of deep-sea fishes.
177. I. H. Bartlett & Sons, New Bedford, Massachusetts, £20 for model of boat for whale and seal fisheries, with apparatus for same.

AWARDS OF DIPLOMAS AND BRONZE MEDALS TO AMERICAN FIRMS AT THE AALBORG EXHIBITION.

1. Gutting Packing Company, San Francisco, California.
2. Potter & Wrightington, Boston, Massachusetts.
3. Gloucester Isinglass and Glue Company, Gloucester, Massachusetts.
4. I. E. Megler & Co., Brookfield, Wahkiakum County, Washington Territory.
5. Albany Beef Packing Company, 372 Greenwich street, New York City, New York.
6. Wolff & Riesing, Eastport, Maine.
7. Henry Mays & Co., Boston, Massachusetts.
8. McMenamin & Co., Hampton, Virginia.
9. Max Ams, 372 and 374 Greenwich street, New York City, New York.
10. Hine & Co., 13 and 15 Doyers street, New York City, New York.

GENERAL TABLE OF CONTENTS.

SECTION A.—PRELIMINARY CATALOGUE AND SYNOPSIS OF EXHIBITS.

Page.

LIST OF PERSONS ENGAGED IN THE PREPARATION OF THE COLLECTION.....
STATISTICS OF THE FISHERIES OF THE UNITED STATES IN 1880.....

COLLECTIVE EXHIBITS OF THE U. S. NATIONAL MUSEUM AND THE U. S. FISH COMMISSION.

A.—AQUATIC ANIMALS AND PLANTS OF NORTH AMERICA BENEFICIAL OR INJURIOUS TO MAN.

I.—MAMMALS..... 5
II.—BIRDS..... 5
III, IV.—REPTILES AND BATRACHIANS..... 5
V.—FISHES..... 6
VI.—MOLLUSKS..... 6
VII.—MARINE AND FRESH-WATER INVERTEBRATES, EXCLUSIVE OF MOLLUSCA..... 7
VIII.—ALGÆ..... 7

B.—FISHING GROUNDS.

IX.—MODELS AND MAPS OF FISHING GROUNDS..... 8
X.—MAPS SHOWING GEOGRAPHICAL DISTRIBUTION..... 8

C.—APPARATUS OF SEA AND FRESH-WATER FISHING.

XI.—CLUBS, SPEARS, DARTS, RAKES, AND DREDGES..... 8
XII.—FISH-HOOKS, JIGS AND DRAILS, ARTIFICIAL BAITS, FLIES AND FLY-HOOKS, GULLETERS, CLEARING RINGS, &C..... 9
XIII.—FISHING-LINES AND RIGGED GEAR..... 9
XIV.—FISHING-RODS, AND REELS FOR LINES AND NETS..... 10
XV.—NETS AND SEINES, AND MATERIALS USED IN THEIR MANUFACTURE 10
XVI.—FISH TRAPS, WEIRS, AND POUNDS..... 11
XVII.—FISHING STATIONS..... 11
XVIII.—KNIVES, GAFFS, AND OTHER APPARATUS..... 11
XIX.—ILLUSTRATIONS OF THE FISHERIES..... 12

D.—FISHING VESSELS, BOATS, AND FITTINGS.

XX.—VESSELS AND BOATS..... 12
XXI.—BOAT FITTINGS AND APPLIANCES..... 12

E.—FISHERMEN AND ANGLERS.

	Page.
XXII.—Fishermen and their Apparel	13
XXIII.—Food, Medicine, Shelter	13
XXIV.—Vessels' Papers	13
XXV.—Habits of Fishermen	13
XXVI.—Fishermen's Tools and Outfits	13

F.—APPARATUS CONNECTED WITH THE WHALING AND SEALING INDUSTRY.

XXVII.—Whaling Vessels and Boats	14
XXVIII.—Whaling Craft, Harpoons, Guns, and Lances	14
XXIX.—Cutting Gear	15
XXX.—Aboriginal Whaling and Sealing Apparatus	15

G.—FISHERY PRODUCTS AND THEIR PREPARATION.

XXXI.—Apparatus and Materials used in the Preparation and Care of Products	16
XXXII.—Products of Fisheries prepared for Food	17
XXXIII.—Products of the Fisheries used for Clothing	17
XXXIV.—Materials Employed in the Arts and Manufactures	18–20

H.—FISH CULTURE.

XXXV.—Apparatus and Methods of Fish Culture	20
XXXVI.—Eggs and Young Fishes	25
XXXVII.—Fish Ways	25
XXXVIII.—Fish Culturists	25

I.—INVESTIGA TION OF THE WATERS AND RESEARCH.

XXXVIII A.—Deep-Sea Research	25
XXXVIII B.—Investigation of the Fresh Waters	26

K.—LITERATURE.

XXXIX.—Books	26

COLLECTIONS DISPLAYED BY SPECIAL EXHIBITORS.

Alphabetical List of Special Exhibitors and their Collections	29

CONCORDANCE TO THE OFFICIAL CLASSIFICATION.

List of Exhibitors in each Official Division	89

Section B.—COLLECTION OF ECONOMIC CRUSTACEANS, WORMS, ECHINODERMS, AND SPONGES.

By Richard Rathbun.

Introduction	109
Crustaceans	109
Crabs	109
Lobsters	112
Cray-fish	116
Rock Lobsters	116
Shrimp and Prawns	117
Amphipods and Isopods	121
King Crab—Horseshoe Crab	121

Page.

SECTION B—Continued.
Worms 122
Echinoderms 123
Sponges 124
List of species of Crustaceans, &c., exhibited 127
Worms 131
Echinoderms 132
Sponges 132
Commercial sponges 132
Injurious species 136
List of photographic views illustrative of the Lobster fishery 137
List of Lobster fishing apparatus 137
Products of Lobster, Crab, and Shrip fisheries 137

SECTION C.—CATALOGUE OF AQUATIC AND FISH-EATING BIRDS.

By ROBERT RIDGWAY.

Prefatory note 141
The water birds of North America 141

LIST OF BIRDS IN THE COLLECTION.

Herodiones.—The Artificial Waders 142
Ardeidæ (the Heron tribe) 142
Ciconiidæ (the Stork tribe) 144
Ibididæ (Ibises) 144
Plataleidæ (the Spoonbills) 145
Limicolæ.—The Shore Birds 145
Hæmatopodidæ (the Oyster-catchers) 145
Strepsilidæ (the Turnstones) 145
Charadriidæ (the Plovers) 146
Scolopacidæ (the Snipe tribe) 148
Phalaropodidæ (the Phalaropes) 153
Paludicolæ.—The Marsh Birds 154
Parridæ (the Jacanas) 154
Rallidæ (the Rail tribe) 154
Aramidæ (the Courlans) 156
Gruidæ (the Cranes) 156
Phœnicopteri.—The Lamellirostral Waders 156
Phœnicopteridæ (the Flamingoes) 156
Anseres.—The Lamellirostral Swimmers 157
Anatidæ (the Duck tribe) 157
Steganopodes.—The Totipalmate Swimmers 164
Tachypetidæ (the Frigate Pelicans) 164
Pelecanidæ (the Pelicans) 164
Phalacrocoracidæ (the Cormorants) 164
Plotidæ (the Anhingas) 166
Sularidæ (the Gannets) 166
Phaëthontidæ (the Tropic Birds) 166
Gaviæ.—The Gull-like Swimmers 167
Rhynchopsidæ (the Skimmers) 167
Laridæ (the Gull tribe) 167
Stercorariidæ (the Skua Gulls) 172
Tubinares.—The Tube-nosed Swimmers 173
Diomedeidæ (the Albatrosses) 173
Procellariidæ (the Petrels) 174

Page.

SECTION C—Continued.
Pygopodes.—The Divers 176
Podicipedidæ (the Grebes) 176
Colymbidæ (the Loons or Divers) 177
Alcidæ (the Auk tribe) 177

MOUNTED GROUPS OF BIRDS.

Group A.—Bittern and Ibises 181
Group B.—Bittern, Herons, and Spoonbill 181
Group C.—Goose and Brant 181
Group D.—Black-bellied and Fulvous Tree Ducks 181
Group E.—Teals, Canvas-back, and Red-head 181
Group F.—Wood Duck, Shelldrake, &c 182
Group G.—Harlequin Duck, Steller's Duck, &c 182
Group H.—American Anhinga, and Snake Bird 182
Group I.—Laughing Gull, Bonaparte's Gull, &c 182
Group J.—Fulmar Petrel, Cinereous Shearwater, &c 183
Group K.—Grebes 183
Group L.—Auks, Puffin, and Guillemot 183

MOUNTED BIRDS.

American Sea Eagle 184
American White Pelican 184
Brown Pelican 184

SECTION D.—CATALOGUE OF THE ECONOMIC MOLLUSCA AND THE APPARATUS AND APPLIANCES USED IN THEIR CAPTURE AND PREPARATION FOR MARKET.

By Lieut. FRANCIS WINSLOW, U. S. N.

Introduction 187
Mollusca Cephalopoda 187
Small Squids 187
Giant Squids 191
Octopus or Devil-Fish 191
Mollusca Encephala 192
Gasteropoda 192
Haliotidæ, &c 193
American Oyster (*Ostrea virginica*) 198
Biology of Oyster 198
Breeding habits 198
Impregnation of eggs 200
Number of eggs 201
The development of the eggs 205
Oyster industry 218
Clams, Mussels, Scallops, &c 229
Catalogue of exhibits 243
Mollusca Cephalopoda 243
Squids and Cuttles 243
Mollusca Gasteropoda 243
Sea Snails 243
Useful for food or bait 243
Useful by producing Pearl Shell 244
Manufactured state of Haliotis Shell 245

Page.

SECTION D—Continued.
Catalogue of exhibits—Continued.
Affording dye, as well as ornamental 245
Affording cameo and porcelain stock 245
Injurious, by destroying food-producing mollusks 245
Mollusca Gasteropoda.
Sea Snails.
Mollusca Lamellibranchiata 246
Bivalve Shell-Fish 246
Affording food or bait 426
American Oyster 248
Useful Bivalves other than Oysters 260
Clams, Mussels, Scallops, &c 260
Use of Ornamental Bivalves other than those affording food 264
Pearl-producing 264
Otherwise useful and ornamental 264
Injurious Bivalves 265
Enemies other than Mollusca, inhabiting oyster-beds and destructive to Shell-Fish 265
Shell-Fish industry 266
Vessels and boats 266
Implements for capture 267
Oyster cultivation 268
Methods of preserving and transporting Shell-Fish 269

SECTION E.—THE WHALE FISHERY AND IT'S APPLIANCES.

By JAMES TEMPLE BROWN.

Introduction 273
The collection of the implements 274

DISPOSITION AND ARRANGEMENT OF OBJECTS.

1. Models 274
2. The whaleboat 276
3. Harpoons, guns, and lances 276
Hand-harpoons 276
Whaling-guns 279
Whaleman's lances 282
Hand-lances 282
Gun-lances 284
4. Implements used exclusively on the vessel 286
Chains 287
Whaleman's spades 288
Ropes used by whalemen 290
Whaleman's hooks 290
Blubber-toggles 290
Whaleman's knives 291
5. Curiosities, vessel's papers, and logs, whale-line and accessories 293
6. Photographs 293

COMMERCIAL IMPORTANCE OF WHALES.

Species of Whales captured 293

STATISTICS OF THE WHALE FISHERY.

Present condition of the Whale industry 296

DESCRIPTIVE LABELS ACCOMPANYING THE OBJECTS. MODELS.

Page.

SECTION E—Continued.
Whaleship, "camels," whaleboat, and tryworks 300

APPARATUS OF CAPTURE.

American whaleboat fully equipped 301
Craft 305
Whaleman's harpoons 305
Non-explosive—thrust by hand 305
Two barbs and fixed head 305
Single-barbed harpoons—fixed heads 307
Improved harpoon, or toggle iron 308
Harpoons for raising sunk whales 311
Darting-gun harpoons 312
Thrust by hand 312
Prussic acid harpoons 313
Harpoons projected from guns non-explosive 314
Explosive harpoons 319
Thrust by hand 319
Projected from guns 320
Iron sheaths 320
Whaling-guns 320
Ordnance 320
Small-arms 321
Shoulder-guns 321
Darting-guns 323
Rocket-guns 325
Whaleman's lances 326
Thrust by hand 326
Seal, sea-elephant, and walrus lances 327
Lances for stopping running whales 327
Explosive lances; projected from guns 328
Non-explosive lances; projected from guns 331
Darting-bombs 332
Rockets 332

APPARATUS FOR MANIPULATING DEAD WHALES, CUTTING OFF THE BLUBBER, BOARDING, MINCING, AND TRYING OUT.

Ropes and blocks for hoisting blubber 333
Whaleman's hooks 333
Used in boat 333
Used on vessel 333
Hooks for cutting blackfish 335
Whaleman's spades 335
Scarfing and leaning 335
Morticing holes in blubber 336
Decapitating the Whale 336
Cutting slivers 336
Cutting out throat-bone, &c 337
Cutting blubber on shipboard 337
Towing the Whale 337
Head axe 337

Page.

SECTION E—Continued.

Chains 338
Hoisting in blubber 338
Head chain 338
Toggles, or fids 338
Hoisting in throat 339
Whaleman's knives 339
Boarding knives 339
Mincing knives 340
Leaning knives 641
Sealers' knives 341
Appliances used when cutting-in the whale 341
Net for scooping spermaceti 341
Case bucket 342
Belts to support the men 342
Needles for reeving chains 342
Manipulating blubber hooks 343
Platforms for officers when cutting-in 343
Try-works gear 343
Bailing oil 343
Removing scraps 344
Blubber pikes 344
Pot pikes 344
Blubber-forks 345
Blubber-gaffs 345
Lights: Try-works lanterns 346

ROPES USED BY WHALEMEN.

Fluke ropes and cutting-falls 346
Guy-ropes and bone yarn 347
Whale-line, warps, and straps 347

WAIFS AND FLAGS.

Boat waifs 348
National flag 348

IMPLEMENTS USED ASHORE.

Whalebone scrapers 349
Coopers' inshaves 349

WHALE-SHIPS, PAPERS AND LOG-BOOKS.

Log-books, slates, and stamps 350
Memoranda of whaler's outfit 351
Ships' papers 352

ACCESSORIES.

Belly-bands, boot-jacks, &c 352
Reel and log-chip, &c 353
Whaleman's ship-bread 355

SCRIMSHAW WORK AND CURIOSITIES.

Canes, banjo, shell-hook, &c 355

ABORIGINAL APPARATUS.

Page.
SECTION E—Continued.
The Indians of Cape Flattery, Washington Territory 360
Whaling implements used by Makah Indians 371
Capturing the whale 371
Impeding the progress of the whale 372
Killing the whale 373
Towing whales ashore 374
Whaleman's clothing 374
Products of the whale 375
Sealing implements used by Makah Indians 375
Spears and accessories 375
Manufacture of twine 376
Implements used by Eskimo tribes 377
Harpoons and spears 377
Seal and walrus lances 381
Float lines and floats 383
Seal decoys, &c 384

SECTION F.—CATALOGUE OF THE COLLECTIONS OF FISHES.

By Dr. TARLETON H. BEAN.

INTRODUCTION.

Description of the collections 389
The Alaskan fishes 390
The American salmonoids 398
Fishes of the Gulf of Mexico and East Florida 400
The genera of fresh-water fishes 402
Partial list of economic fresh-water fishes 403

CATALOGUE OF FISHES IN ALCOHOL.

Fishes of Alaska 405
Gasterosteidæ (Sticklebacks) 405
Pleuronectidæ (Flounders and Halibut) 405
Gadidæ (Pollock, Cod, &c.) 407
Lycodidæ 408
Cryptacanthidæ 408
Stichæidæ 408
Xiphisteridæ 409
Anarrhichadidæ 410
Trachinidæ 410
Trichodontidæ 410
Leiparididæ 410
Cyclopteridæ 411
Agonidæ 411
Cottidæ 411
Scorpænidæ 414
Chiridæ 414
Ammodytidæ 415
Umbridæ 415
Salmonidæ (Smelt, Salmon, &c.) 415
Clupeidæ 419
Catastonidæ 420
Chimæridæ 420
Galeorhinidæ 420
Spinacidæ 420

Page.

SECTION F—Continued.
American Salmonoids 420
Argentininæ 420
Coregoninæ 422
Salmoninæ 424
Fishes of the Gulf of Mexico and East Florida 428
Maltheidæ 428
Diodontidæ 428
Tetrodontidæ 428
Ostraciontidæ 429
Balistidæ 429
Hippocampidæ 430
Syngnathidæ 430
Soleidæ 430
Pleuronectidæ 431
Ophidiidæ 431
Blenniidæ 432
Opisthognathidæ 432
Batrachidæ 433
Uranoscopidæ 433
Gobiesocidæ 434
Gobiidæ 434
Triglidæ 435
Scorpænidæ 435
Scaridæ 435
Labridæ 435
Pomacentridæ 436
Polynemidæ 436
Acanthuridæ 437
Chætodontidæ 437
Trichiuridæ 437
Scombridæ 437
Carangidæ 438
Coryphænidæ 440
Stromateidæ 440
Nomeidæ 440
Sciænidæ 440
Gerridæ 442
Sparidæ 443
Pristipomatidæ 443
Centrarchidæ 445
Serranidæ 446
Ephippiidæ 447
Pomatomidæ 448
Elacatidæ 448
Echeneididæ 448
Mugilidæ 448
Atherinidæ 449
Belonidæ 450
Scombresocidæ 450
Esocidæ 450
Cyprinodontidæ 451
Synodontidæ 453
Albulidæ 454
Clupeidæ 454

Page.

SECTION F—Continued.
Fishes of the Gulf of Mexico and East Florida—Continued.
Dorosomatidæ 455
Catastomidæ 455
Cyprinidæ 455
Siluridæ 455
Anguillidæ 456
Murænidæ 456
Trygonidæ 456
Sphyrnidæ 457
Galeorhinidæ 457
Genera of fresh-water fishes 457
Syngnathidæ 457
Gasterostidæ 457
Soleidæ 458
Gadidæ 458
Gobiidæ 459
Cottidæ 459
Cichlidæ 459
Embiotocidæ 460
Sciænidæ 460
Elassomatidæ 460
Centrarchidæ 460
Percidæ 464
Labracidæ 467
Aphredoderidæ 468
Atherinidæ 468
Belonidæ 469
Amblyopsidæ 469
Esocidæ 469
Umbridæ 470
Cyprinodontidæ 470
Characinidæ 472
Percopsidæ 472
Salmonidæ 472
Hyodontidæ 475
Clupeidæ 475
Dorosomatidæ 476
Catostomidæ 477
Cyprinidæ 480
Siluridæ 491
Anguillidæ 492
Amiidæ 492
Lepidosteidæ 492
Polyodontidæ 493
Acipenseridæ 493
Trygonidæ 494
Petromyzontidæ 494

CATALOGUE OF CASTS AND PHOTOGRAPHS OF FISHES.

Lophiidæ (Goose-fish) 495
Orthagoriscidæ (Sunfish) 495
Diodontidæ (Bur-fish) 495
Tetrodontidæ (Rabbit-fish) 495

Page.

SECTION F—Continued.
Ostraciidæ (Cow-fish) 495
Balistidæ (Leather-jacket, Old Wife, and File-fish) 495
Syngnathidæ (Pipe-fish) 495
Soleidæ (American Sole) 496
Pleuronectidæ (Flounders and Halibut) 496
Gadidæ (Pollack, Cod, Haddock, Hake, &c.) 497
Merluciidæ (Whiting) 497
Ammodytidæ (Sand Launce) 497
Xiphisteridæ (Rock-eel) 497
Anarrhichadidæ (Leopard Wolf-fish) 497
Batrachidæ (Sarpo) 498
Cyclopteridæ (Lump-fish) 498
Triglidæ (Sea Robin) 498
Cottidæ (Sculpins) 498
Hemitripteridæ (Sea Raven) 498
Scorpænidæ (Norway Haddock and Corsair) 498
Chiridæ (Rock Trout) 498
Labridæ (Tautog and Cunner) 499
Embiotocidæ (Blue Perch) 499
Xiphiidæ (Sail-fish) 499
Trichiuridæ (Scabbard-fish) 499
Scombridæ (Mackerel, Bonino, &c.) 499
Carangidæ (Moon-fish, Crevallé, &c.) 500
Coryphænidæ (Great Dolphin) 501
Stromateidæ (Harvest-fish) 501
Sciænidæ (Squeteague, Fresh-water Drum, &c.) 501
Sparidæ (Sheep's Head and Scuppaug) 502
Pristipomatidæ (Red Snapper, Golden-tail, &c.) 502
Centrarchidæ (Rock Bass, Sunfish, &c.) 502
Serranidæ (Spotted Hind, Scamp, &c.) 503
Percidæ (Yellow Perch and Canada Pike Perch) 503
Labracidæ (Striped Bass, White Perch, &c.) 503
Ephippiidæ (Moon-fish) 504
Lobotidæ (Flasher) 504
Pomatomidæ (Bluefish) 504
Elacatidæ (Crab-eater) 504
Priacanthidæ 504
Echeneididæ (Sucker-fish) 504
Sphyrænidæ (Barracuda) 504
Mugilidæ (Striped Mullet) 504
Atherinidæ (Silverside) 505
Gasterosteidæ (10-spined Stickleback) 505
Belonidæ (Silver Garfish) 505
Esocidæ (Pickerel, Pike, and Muskellunge) 505
Cyprinodontidæ (May-fish 505
Salmonidæ (Smelt, Whitefish, Salmon, &c) 505
Albulidæ (Lady-fish) 506
Hyodontidæ (Moon-eye) 506
Elopidæ (Big-eyed Herring) 506
Clupeidæ (Shad and Branch Alewife) 506
Engraulididæ (Anchovy) 507
Catostomidæ (Suckers) 507
Cyprinidæ (Sacramento Pike) 507
Siluridæ (Catfish) 507

Page.

SECTION F—Continued.

Anguillidæ (Eels) 507
Amiidæ (Bowfin) 507
Lepidosteidæ (Garpike) 508
Polyodontidæ (Paddle-fish) 508
Acipenseridæ (Sturgeons) 508
Myliobatidæ (Eagle Ray, Clam-cracker, &c.) 508
Trygonidæ (Butterfly Ray and Sting Ray) 508
Torpedinidæ (Torpedo or Cramp-fish) 508
Raiidæ (Claw-nosed Skate, &c.) 509
Squatinidæ (Monk-fish) 509
Lamnidæ (Mackerel Shark) 509
Carchariidæ (Sand Shark) 509
Alopiidæ (Thresher Shark) 509
Sphyrnidæ (Shovel-head and Hammer-head Sharks) 509
Galeorhinidæ (Spotted-fin Shark, Tiger Shark, &c.) 509
Spinacidæ (Spined Dogfish and Brown Dogfish) 510
Scymmidæ (Sleeper Shark) 510
Petromyzontidæ (Sea Lamprey) 510

SECTION G.—DESCRIPTIVE CATALOGUE OF THE COLLECTION ILLUSTRATING THE SCIENTIFIC INVESTIGATION OF THE SEA AND FRESH WATERS.

By RICHARD RATHBUN.

Introduction 513
Investigations under the direction of the U. S. Government in the United States and adjacent regions, not including Alaska 514
The U. S. Coast and Geodetic Survey 514
The U. S. Commission of Fish and Fisheries 517
War Department 523
Interior Department 525
State Department 525
Treasury Department 525
Smithsonian Institution 525
Investigations by State surveys 526
Investigations in Alaska 527
Western Union Telegraph Expedition 527
United States Coast Survey 527
Treasury Department 528
Signal Service Bureau of the War Department 528
Smithsonian Institution 529
Investigations under the U. S. Government in foreign countries 529
Navy Department 529
The Wilkes Expedition 532
The North Pacific Exploring Expedition 532
Other surveys under Navy Department 534
State Department 535
War Department, Signal Service Bureau 535
Smithsonian Institution 535
Investigations by Museums and Societies of Natural History 536
The Museum of Comparative Zoölogy of Harvard College 536
The Portland Society of Natural History 539
Essex Institute and Peabody Academy of Natural Science 539
Boston Society of Natural History 539
Lyceum of Natural History of New York 539
American Museum of Natural History, New York 539

SECTION G—Continued. Page.
Investigations by Museums and Societies of Natural History—Continued.
Academy of Natural Sciences of Philadelphia 539
Elliott Society of Charleston, South Carolina 540
Chicago Academy of Science 540
California Academy of Science, San Francisco 540
Private collectors 540
Investigations by Colleges 540
Bowdoin College, Maine 540
Williams College, Massachusetts 540
Amherst College, Massachusetts 540
Brown University, Rhode Island 540
Yale College, Connecticut 540
Wesleyan University, Connecticut 541
Cornell University, New York 541
Union College, New York 541
Vassar College, New York 541
Rochester University, New York 541
Princeton College, New Jersey 541
Johns Hopkins University, Maryland 541
University of Indiana and Butler University 541

DESCRIPTIVE CATALOGUE OF COLLECTION.

Vessels employed in marine explorations 543
The United States Fish Commission steamer Albatross 543
The United States Fish Commission steamer Fish Hawk 550
The United States Coast Survey steamer Blake 554
Apparatus for collecting zoölogical materials 559
Naturalists' deep-sea dredge 559
Naturalists' boat-dredge 559
Blake dredge 560
Chester rake-dredge 560
Benedict rake-dredge 561
Beam trawl 562
Blake trawl or double-beam trawl 563
Tangle-frame and swabs 565
Towing nets 566
Trawl wings 566
Sigsbee's gravitating trap 567
Baird seine 569
Dip net 570
Accessory appliances used in dredging and trawling 570
Steel wire dredge-rope 570
Sigsbee's improved dredging accumulator 572
Iron dredge blocks 573
Brass dredge blocks 573
Safety hooks 574
Appliances for the examination and storage of zoölogical material 574
Table or deck sieve 574
Cradle or rock sieve 575
Circular hand sieves 576
Small sieves 577
Fish pans and sorting dishes 577
Naturalists' forceps 578
Copper tanks 578
Glass jars, bottles, and vials 579

Page.

SECTION G—Continued.
Appliances for deep-sea sounding 580
Sigsbee's deep-sea sounding machine 580
The Tanner sounding machine 583
Sigsbee's correction curve 584
Steel piano-forte wire 585
Splices in sounding wire 587
Steel wire, used in taking temperatures 589
Sounding leads 589
Sigsbee-Belknap sounding rod 589
Apparatus for physical observations, &c 590
The Bailie-Tanner thermometer attachments 590
Sigsbee's water specimen cup 593
Water specimen cup (old style) 595
Hilgard's ocean salinometer 595
Hilgard's optical densimeter 596
Cans for observing ocean currents 597
Marine Zoological Stations 597
The Agassiz Zoological Laboratory 597
Maps, models, and collections of natural history 599
Model of western part of North Atlantic 599
Model of Gulf of Maine 599
Model of off-shore fishing banks 599
Charts and publications of United States Coast Survey 599
Charts of United States Hydrographic Bureau 600
Chart of Bering Strait 600
Chart of currents in Bering Sea 600
Charts showing isobars, isotherms, &c., in Alaska 600
Chart showing dredging stations of United States Fish Commission 600
Collections of fishes (see Section F) 600
Collections of marine invertebrates by Fish Commission and Coast Survey 600
Pycnogonida 600
Crustacea 601
Annelida 602
Mollusca 602
Echinodermata 603
Anthozoa 605
Porifera 607
Collection of fresh-water crayfishes 607
Collection of American fresh-water sponges 609
Collection of marine algæ from the Atlantic and Pacific coasts of the United States 614
Herbarium of North American algæ 620

SECTION H.—CATALOGUE OF AQUATIC MAMMALS.

By FREDERICK W. TRUE.

Introduction 625
Pinnipedia 625
The Fur Seal 625
The Fur Seal fishery 626
Sirenians 628
The Manatees 628
The Rhytina 628

Page.

SECTION H—Continued.
Cetaceans 629
The economic value of the Cetaceans 630
The decrease in the abundance of American Cetaceans 631
Dolphins 632
Porpoises 632
The blackfish and the grampus 633
The killers 633
The sperm whale and the pigmy sperm whale 633
Ziphioid whales 634
The gray whale 634
Finbacks and sulphur-bottoms 635
Humpbacks and right whales 635

ANNOTATED LIST OF THE AQUATIC ANIMALS OF NORTH AMERICA, WITH CATALOGUE OF SPECIMENS EXHIBITED AT LONDON.

Sirenia 637
Trichechidæ 637
Cete (suborder Denticete) 637
Delphinidæ 637
Globiocephalidæ 639
Ziphiidæ 640
Physeperidæ 641
Cete (suborder Mysticeti) 641
Rhachianectidæ 641
Balænopteridæ 642
Carnivora (suborder (Pinnipedia) 643
Phosidæ 643
Otariidæ 643
Odobænidæ 644

SECTION I.—CATALOGUE OF THE COLLECTION, ILLUSTRATING THE FISHING VESSELS AND BOATS AND THEIR EQUIPMENT; THE ECONOMIC CONDITION OF FISHERMEN; ANGLERS' OUTFITS, ETC.

By CAPTAIN J. W. COLLINS.

(For a more detailed table of contents of this section see pages ——.)

A.—Introduction 651
B.—Fishing craft 670
Vessels 670
Boats 689
Sketches and photographs of vessels and boats 709
C.—Fittings and appliances for vessels and boats 722
D.—Fishermen and anglers 782
E.—Food, medicine, and shelter 803
F.—Vessels' papers 815
G.—Habits of fishermen 818
H.—Life-saving material 822

SECTION J.—CATALOGUE OF APPARATUS FOR THE CAPTURE OF FISH.

By R. EDWARD EARLL.

(For a more detailed table of contents of this section see pages ——.)

A.—Apparatus of direct application 833
I.—Hand implements 833
For striking 833

Page.

SECTION J—Continued.
A.—Apparatus of direct application—Continued.
I.—For cutting 834
For thrusting 847
II.—Implements for seizure of objects 851
B.—Apparatus of indirect application 892
III.—Missiles 892
Simple missiles 892
Centrifugal missiles 892
Missiles propelled by a spring 895
Missiles propelled by explosives 902
IV.—Baited fish-hooks, angling tackle, &c 902
C.—Apparatus to a greater or less extent automatic 987
V.—Nets 987
D.—Apparatus entirely automatic 1017
VI.—Traps 1017
E.—Accessories to fishing 1029
VII.—Decoys and disguises 1029

SECTION K.—CATALOGUE OF FISHERY PRODUCTS, AND OF THE APPARATUS USED IN THEIR PREPARATION.

By A. HOWARD CLARK.

(For a more detailed table of contents of this section see page ——.)

A.—Introduction 1037
B.—Methods of preparation 1050
I.—Preparation and preservation of food 1050
II.—Preparation of oils, guano, and glue 1090
III.—Wharves, markets, and transportation 1094
IV.—Patents relating to fishery products 1097
C.—Animal products and their application 1099
V.—Fishery products used for food 1099
VI.—Fishery products used for clothing 1117
VII.—Materials used in the arts and manufactures 1127

SECTION L.—CATALOGUE OF THE FISH-CULTURAL EXHIBIT OF THE UNITED STATES FISH COMMISSION.

By R. EDWARD EARLL.

(For table of contents in detail see Section L, pages ——.)

A.—Introduction 1159
B.—Investigation 1174
I.—Commissions and societies engaged in the investigation of questions relating to fish culture 1174
II.—Results of inquiry 1176
C.—Protection 1201
III.—Legislation 1201
IV.—Assistance to fish in reaching their spawning grounds 1201
V.—Purification of streams 1207
D.—Artificial propagation 1208
VI.—Apparatus for the manipulation of eggs and young fish 1208
VII.—Results of fish culture 1245

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

A.

PRELIMINARY CATALOGUE

AND

SYNOPSIS OF THE COLLECTIONS EXHIBITED BY THE UNITED STATES FISH COMMISSION

AND

BY SPECIAL EXHIBITORS.

WITH A CONCORDANCE TO THE OFFICIAL CLASSIFICATION OF THE EXHIBITION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.

2444—Bull. 27

COLLECTIVE EXHIBIT

OF THE

UNITED STATES.

COLLECTIVE EXHIBIT OF THE UNITED STATES.

ANALYSIS.

SECTION A.—AQUATIC ANIMALS AND PLANTS OF NORTH AMERICA BENEFICIAL OR INJURIOUS TO MAN.

I.—MAMMALS.

1. Group of Fur Seals, *Callorhinus ursinus*, with screen of water-color sketches by Henry W. Elliott, illustrating the seal life of the Prybilov Islands; stuffed Ribbon Seal, *Histriophoca equestris;* cast of Harbor Seal, *Phoca vitulina;* stuffed head of walrus, *Odobænus obesus.*
2. Cast of Manatee, *Trichechus manatus*, skull of *Rhytina gigas*, from Bering Island.
3. Casts of White Whale, *Delphinapterus*, and of fœtal Black-fish, *Globicephalus.*
4. Casts of several smaller toothed cetaceans, with skulls of the same; casts of heads of cetaceans.

II.—BIRDS.

5. Collection of skins of Aquatic Birds of the United States, exhibited by the United States National Museum.
6. Mounted groups of Aquatic Birds.

III, IV.—REPTILES AND BATRACHIANS.

7. Cast of Alligator, *Alligator mississippiensis.*
8. Casts of Diamond-Back Terrapin, *Malacoclemmys palustris*, Slider Terrapin, *Pseudemys rugosa*, Alligator Terrapin, *Macrochelys lacertina*, Soft-shell Turtle, *Aspidonectes ferox*, Green Turtle, *Chelonia mydas*, Loggerhead Turtle, *Thalassochelys caouana*, Leatherback Turtle, *Sphargis coriacea.*
9. Casts of Water Snakes, *Tropidonotus sipedon*, Moccasin, *Ancistrodon piscivorus*, Rattlesnake, *Crotalus adamanteus*, &c.
10. Collection of 24 species of tailed batrachians, including *Siren*, *Necturus*, *Amphiuma*, *Menopoma*, *Amblystoma*, *Siredon*, &c.
11. Four species of edible frogs, including Giant Bullfrog, *Rana Catesbiana.*
12. Tank of living reptiles.

SECTION A.—AQUATIC ANIMALS AND PLANTS, ETC.

V. FISHES.

13. Casts of 121 characteristic fishes, including most of the important economic species, arranged on nine screens.
14. Cast of Giant Catfish, *Amiurus ponderosus*, and of Guasa, *Promicrops guasa*.
15. A series of photographs of the important fishes of the United States.
16. A series of proofs of engravings of the food fishes of the United States, prepared to accompany the forthcoming quarto report, with specimens of the original drawings.
17. Color sketches of fishes; chromo-lithographs of twenty water color sketches of game fishes exhibited by Charles Scribner's Sons (publishers of Kilbourne & Goode's Game Fishes of the United States).
18. Series of fishes in alcohol:
    - *a*. Fishes of Alaska.
    - *b*. Fishes of the Adirondacks, collected by Fred. Mather.
    - *c*. The American Salmonoids.
    - *d*. Fishes of the Gulf of Mexico and East Florida.
    - *e*. The genera of fresh-water fishes.
19. Living fish eggs, fishes, &c. All under fish culture; section F.
20. Collection of market fishes in fresh condition on ice sent from time to time by E. G. Blackford, New York.

VI.—MOLLUSKS.

21. Models of Giant Squid, *Architeuthis princeps* and of Giant Octopus, *Octopus punctatus*, prepared under direction of J. H. Emerton.
22. Series of Gastropods, useful as affording food, bait, &c., or injurious by destroying edible mollusks.
23. Series of specimens showing the life of the American Oyster from the time of attachment to full growth, under various conditions influencing development.
24. Collection of plates and diagrams illustrating the embryology of the American Oyster.
25. Series of American Oysters, illustrating geographical distribution and local variation.
26. Other useful Mollusks, *Unio*, *Haliotis*, &c.
27. Specimens illustrating injurious work of *Teredo* and other pernicious Mollusks.
28. Enemies of the Oyster.

SECTION A.—AQUATIC ANIMALS AND PLANTS, ETC.

VII.—MARINE AND FRESH-WATER INVERTEBRATES, EXCLUSIVE OF MOLLUSCA.

29. Collection of economic Crustaceans, mainly alcoholic, containing forty-eight species, used as food and bait, and injurious to submarine structures of wood. It includes the Lobster, *Homarus americanus;* Rock-lobster, or Salt-water Crayfish, *Panulirus interruptus;* River Crayfish, *Cambarus* and *Astacus;* Common Edible Crab, *Callinectes hastatus;* Rock Crabs, *Cancer irroratus* and *borealis;* California Market Crab, *Cancer magister;* Stone Crab, *Menippe mercenaria;* Common Shrimp, *Crangon vulgaris;* Southern Shrimp, *Pcnæus setiferus;* California Shrimp, *Crangon franciscorum;* King Crab, *Limulus Polyphemus*, etc.

30. Collection of economic worms in alcohol, including the marine annelids most commonly used as bait, and the American medicinal leech, *Macrobdella decora*, Verrill.

31. Collection of economic echinoderms, mostly in alcohol, containing five species, used as food, or available as such, injurious to oyster beds, &c., as follows: Sea Cucumber, *Pentacta frondosa;* Sea Urchins, *Strongylocentrotus dröbachiensis, S. franciscorum, Echinarachnius parma;* Starfishes, *Asterias vulgaris*, and *A. Forbesii.*

32. Collection of Florida commercial sponges, containing six species and two hundred and thirty-seven specimens, furnished by McKesson & Robbins, of New York. The species are as follows: Glove Sponge, *Spongia graminea;* Sheepswool Sponge, *S. gossipina;* Velvet Sponge, *S. meandriniformis;* Grass Sponge, *S. cerebriformis;* Yellow Sponge, *S. corlosia* and *dura.* From the same source, four specimens of Sheepswool Sponge, illustrating artificial propagation by means of cuttings. Also, one specimen of the boring sponge, *Cliona sulphurea.*

33. Complete collection of the described species of fresh-water Cray-fish, *Cambarus* and *Astacus*, occurring within the limits of the United States. Contains 40 species.

VIII.—ALGÆ.

34. Collection of marine Algæ of the United States, prepared by W. G. Farlow.

35. Plates of Wood's Fresh-water Algæ of the United States.

SECTION B.—FISHING GROUNDS.

IX.—MODELS AND MAPS OF FISHING GROUNDS.

36. Cardboard model in relief of the off-shore banks of North America, from the Grand Bank to New Jersey, showing contours to a depth of 2,800 fathoms.
37. Relief model of the Gulf of Maine, prepared by C. Lindenkohl.
38. Relief models of the Eastern Continental Slope, prepared by the United States Coast Survey.
39. Model of a Chesapeake oyster-bed, showing effects of dredging and undredged portions, prepared by Lieut. Francis Winslow, U. S. N.
40. Chart showing the location and extent of the present and abandoned whaling grounds of the world, prepared by A. Howard Clark.
41. Series of charts showing the location of the Oyster beds and the present condition and progress of Oyster culture, prepared by Lieut. Francis Winslow, U. S. N.
42. Charts showing the location of the principal fishing grounds.
43. General coast charts are exhibited by the United States Coast Survey, United States Navy Hydrographic Office, and S. Thaxter & Sons.

X.—MAPS SHOWING GEOGRAPHICAL DISTRIBUTION.

44. Charts showing distribution of the pinnipeds of the world, prepared by J. A. Allen.
45. Chart showing geographical distribution of the seals and fur-bearing animals of Alaska, prepared by W. H. Dall.
46. Series of eight charts, showing distribution of food and game fishes of North America, prepared by G. Brown Goode.

SECTION C.—APPARATUS OF SEA AND FRESH-WATER FISHING.

XI.—CLUBS, SPEARS, DARTS, RAKES, AND DREDGES.

47. Bows and arrows, darts, throwing-sticks, spears, harpoons, clubs, spear-rests, &c., made and used by the Indians and Eskimos of Alaska, the Northwest coast, and other parts of the United States.
48. Eel spears, porpoise and dolphin grains, swordfish lily irons and lances, and harpoons used along the Atlantic seaboard for the capture of numerous species; halibut killer and gob-stick for killing the fish and disgorging the hook; squid jigs used by Grand Bank codfisher-

SECTION C.—APPARATUS OF SEA AND FRESH-WATER FISHING.

XI.—CLUBS, SPEARS, DARTS, RAKES, AND DREDGES—Continued.

men in the capture of squid for bait; mackerel gaff or gambeering iron and mackerel bob formerly used by New England fishermen for the capture of mackerel without the use of bait.

49. Oulachan rake, used by the Indians of the Northwest coast; clam-rakes, hoes, and claws, sponge-hook, moss-rakes, oyster-tongs, rakes, and scrapes.

XII.—FISH-HOOKS, JIGS AND DRAILS, ARTIFICIAL BAITS, FLIES AND FLY-HOOKS, GULLETERS, CLEARING RINGS, &C.

50. Series of Indian and Eskimo hooks made of bone, wood, and iron.
51. Series of steel hooks, showing the manufacture of hooks from the plain wire to the finished hook, and all the principal varieties of fish-hooks used in sea and fresh-water fishing, including the Barbless, Limerick, Central-Draught, Kirby, Aberdeen, Kinsey, Carlisle, shark and dog-fish hooks.
52. Jigs and drails for the capture of cod, weakfish, Spanish mackerel, bass, bluefish, and dolphin; mackerel jigs formerly extensively used, with lead, ladles, molds, file, rasp, &c., used in their manufacture.
53. Spoon-baits, trolling-spoons, spinners, minnows, and insects, for salmon, trout, bass, pike, and pickerel fishing.
54. Case of lure-baits and ornamental hooks from Alaska.
55. Collection of over seven hundred varieties of salmon, bass, and trout flies, arranged on cards and labelled with their trade names.
56. Case of insects used for bait and injurious or useful to the fisheries, prepared by Prof. C. V. Riley.
57. Spring hooks for pickerel, "snap and catch'em hooks," Edgar barbless hooks, eagle-claw trap.
58. Bait boxes, creels, gulleters, clearing rings, pocket scales, and other miscellanous articles used by anglers.

XIII.—FISHING LINES AND RIGGED GEAR.

59. Indian and Eskimo lines made of kelp, whale and seal hide and cedar bark.
60. Cotton lines, shroud-laid and cable laid, white and tarred; linen, flax, grass, and silk lines, including water-proof fly lines, and other silk lines for salmon and trout fishing.
61. Spanish gut as imported for the manufacture of leaders; single, double and twisted gut leaders; minnow gangs, brails, gangings, used in various sea fisheries.

SECTION C.—APPARATUS OF SEA AND FRESH-WATER FISHING.

XIII.—FISHING LINES AND RIGGED GEAR—Continued.

62. Stone, lead, brass, and composition sinkers for nets, seines, and hand lines.

63. Indian and Eskimo floats carved in wood; glass, cork, and wood floats for nets and lines in sea fisheries; wood, cork and quill floats for pond fishing.

64. Hand-lines rigged for cod fishing on the off-shore and in-shore banks and ledges; pollock hand-lines; bluefish trolling lines; lines for pond fishing; gear for the capture of catfish, weakfish, and other species; Indian trawl lines made of cedar; cod, haddock, and halibut trawls in sections and fully rigged with buoys and anchors; snares and eel bobs; Indian fishing lines from Alaska and the Northwest coast.

XIV.—FISHING RODS, AND REELS FOR LINES AND NETS.

65. Plain and split bamboo rods, for salmon, trout, bass, and general fishing; ash and hornbeam, and ash and lancewood rods; combination trolling pole, harpoon-line holder and cane; and other kinds of rods.

66. Simple reels for fly-fishing, with and without check, made of brass, German silver, rubber, ebonite, and celluloid. Multiplying reels for bass-fishing, with and without check; automatic reels, Kentucky reel, quadruple, multiplying, nickel-plated reel. Spools, winders, trawl-line rollers, line chocks for whale boats, trawl-winch or hurdy-gurdy, &c.

XV.—NETS AND SEINES AND MATERIALS USED IN THEIR MANUFACTURE.

67. Twine used in making nets and seines, exhibited by American Net and Twine Company. Samples of netting, white, tanned and tarred, showing varieties of mesh and kinds of twine.

68. Gill nets, full-sized and in models, for the capture of shad, cod, mackerel, herring, white-fish, minnows, and other species. Gill nets made by the Indians from animal fiber, "Babiche," &c.

69. Trammel nets used for general fishing in rivers and ponds of Northern Mississippi Valley. Herring and cod seines. "Baird collecting seine." Seines and nets made of grass, pineapple fibers, and other materials.

SECTION C.—APPARATUS OF SEA AND FRESH-WATER FISHING.

XV.—NETS AND SEINES, ETC.—Continued.

70. Handle or dip nets and landing nets used in the capture or in handling of mackerel, menhaden, trout, and other fish. Net used in the capture of the oulachan and surf smelt by the Indians of the Northwest coast. Dip nets or baskets used by the Indians.
71. Oyster dredge and hoisting apparatus, dredge nets, dredges for clams and other shell-fish. Full-sized oyster dredge used by steam dredgers.
72. Folding or jerk nets, including full size and model mackerel purse seines and model mackerel-seine pocket, mullet and shrimp cast-nets, &c. Model of mackerel purse-seine on scale of one-twenty-fifth.

XVI.—FISH TRAPS, WEIRS, AND POUNDS.

73. Models and drawings of fish slides and wheels used for catching shad in the rivers of North Carolina.
74. Models of bar weirs and brush weirs used for catching herring in the Bay of Fundy; salmon weirs, heart-nets, pound-nets, floating traps, basket weirs from Alaska, &c. Model of fish weir used by aborigines of Virginia in the fifteenth century.
75. Wicker fish pots used by Indians of California and by fishermen of Florida. Lobster pots in full size, and models showing the various styles used on the coast of New England.
76. Eel pots, with and without leaders, full size and model fyke nets, bass trap, &c.

XVII.—FISHING STATIONS.

77. Model of shad battery at Havre de Grace, Maryland: model of pound fishing for white-fish at Grassy Bay, Detroit River, Michigan.

XVIII.—KNIVES, GAFFS, AND OTHER APPARATUS.

78. Indian and Eskimo knives made of stone, bone, and iron for cutting fish and blubber.
79. Cod splitting, ripping, and throating knives; finning and flitching knives; boat chopping knives; mackerel splitting and reaming or creasing knives; scaling knives, slivering knives, &c.
80. Salmon, cod, haddock, halibut, and mackerel gaffs; halibut-cutters; hook used in decapitating fish; fish forks and "pews" used in storing and handling fish.

SECTION C.—APPARATUS OF SEA AND FRESH-WATER FISHING.

XVIII.—KNIVES, GAFFS, ETC.—Continued.

81. Bait mill for grinding fish for mackerel bait; clam-choppers, &c.

XIX.—ILLUSTRATIONS OF THE FISHERIES.

82. Series of sketches in crayon illustrating the various sea fisheries.
83. Series of photographs, large and small, illustrating the methods employed in the hand-line and trawl-line, cod and halibut fisheries, the lobster and other fisheries.

SECTION D.—FISHING VESSELS, BOATS, AND FITTINGS.

XX.—VESSELS AND BOATS.

84. Series of rigged models of all types of vessels used in the fisheries past and present.
85. Series of builders' models showing evolution of the New England fishing schooner.
86. Series of models of all important types of boats used in the fisheries; also full-size whale boat, dories, shadow canoe, portable and folding boats, Eskimo bidarka, Indian birch canoe, &c.
87. Series of large photographs, 30 by 40 inches, showing fishing boats and vessels in different situations.
88. Series of large photographs of ship yards and boat shops illustrating the construction of fishing craft.

XXI.—BOAT FITTINGS AND APPLIANCES.

89. Canvas used on fishing vessels, exhibited by Russell Mills Company, Old Colony Mills, and others.
90. Cordage used by fishing vessels, exhibited by Sewell, Day & Co., and others.
91. Model of steam windlass, exhibited by American Ship Windlass Company; models of capstans exhibited by Frederick S. Allen.
92. A collection of nautical instruments and books, such as are used on the New England fishing vessels.
93. A series of cabin lamps, lanterns, torches, &c., used on vessels and boats and in fishing.
94. Fog horns of various types, including Collins's patent fog-alarm.
95. Copper paint for vessels; Nelsen's canvas-preserving solution.

SECTION D.—FISHING VESSELS, BOATS, AND FITTINGS.

XXI.—BOAT FITTINGS AND APPLIANCES—Continued.

96. A large number of special appliances for rigging vessels and boats, exhibited by Wilcox, Crittenden & Co., and others; chafing gear, hanks, grommets, clews, thimbles, row-locks, rudder fixtures, &c.

97. Collins's adjustable marine drag, and Collins's improved adjustable marine drag.

98. A collection of oars and paddles, exhibited by E. W. Page and others.

99. Charts of United States Coast Survey, United States Hydrographic Office, S. Thaxter & Son, and others.

SECTION E.—FISHERMEN AND ANGLERS.

XXII.—FISHERMEN AND THEIR APPAREL.

100. Lay figures of fishermen of different classes, showing costumes, implements, &c.

101. Photographs, 30 by 40 inches, showing groups of fishermen of different nationalities, or engaged in the several branches of the fisheries.

102. A collection of fishermen's wearing apparel, in woolen, oiled cotton, rubber, boots, mittens, &c.

103. A collection of anglers' wearing apparel.

XXIII.—FOOD, MEDICINE, SHELTER.

104. Canned, steam-dried, and other foods used by fishermen and anglers.

105. A fisherman's medicine chest, such as is carried by the Gloucester schooners.

106. Series of photographs of fishermen's houses, boarding-houses, bethels, &c.

107. Anglers' tents, and portable houses for anglers, with complete camping outfit.

XXIV.—VESSELS' PAPERS.

108. Vessel's papers, insurance policies, log-books of fishing voyages; papers of Gloucester Seamen's and Fishermen's Widows' and Orphans' Aid Society.

XXV.—HABITS OF FISHERMEN.

109. Collection illustrating the games, amusements, literature, art work of the fishermen, musical instruments, carvings, &c.

XXVI.—FISHERMEN'S TOOLS AND OUTFITS.

110. Fishermen's tools, ditty-boxes, palms, sail-needles, knives, netting-needles and mesh-boards, coopering tools, &c.

SECTION F.—APPARATUS USED IN THE WHALING AND SEALING INDUSTRY.*

XXVII.—WHALING VESSELS AND BOATS.

111. Model of a four-boat whale ship, with a decapitated sperm whale alongside, illustrating the manner in which the blubber is cut off, hoisted in, and lowered into the blubber room; also showing the amount of canvas carried by a vessel while engaged in this work, and the stations of the officers and foremast hands, as well as the positions of the try-works and whale boats.

112. Model of the "camels", which were built in 1842, for floating whaling vessels over Nantucket Bar, with the hull of a vessel showing the relative positions of the one to the other when in operation.

113. Model of try-works transported by whaling vessels, for extracting the oil from the blubber, with the receptacles for scrap and for cooling the oil; also, miniature models of some of the implements commonly known as "try-works gear" for manipulating the oil and scrap.

114. A full-sized whale boat, 28 feet long, with all the apparatus of capture; the names of the various parts of the boat; the boat fittings, and each article used in the chase and capture of the whale are plainly marked.

XXVIII.—WHALING CRAFT, HARPOONS, GUNS, AND LANCES.

115. A series of 47 hand-harpoons, arranged in groups, but not in chronological order, including the forms employed by the early and modern whalemen, and several types of the walrus-harpoon.

116. A series of guns, including 8 shoulder guns of different patterns, both breech-loading and muzzle-loading; several types of the darting gun; one swivel gun, and a rocket gun; also accessories, including cartridges, wads, &c.

117. A series of 33 gun harpoons of various forms. Though these irons have no commercial value at present, with the exception perhaps of those intended for the swivel-gun, yet they have been used, and are interesting and valuable as a whole, constituting as they do the numerous links in the chain that connects the past with the present.

---

* Here are included, for convenience of arrangement, the apparatus of manufacture or preparation of whaling products, the preliminary stages of which being usually conducted on board of the whaling vessels may be regarded as a portion of the fishery proper.

SECTION F.—APPARATUS USED IN THE WHALING AND SEALING INDUSTRY.

XXVIII.—WHALING CRAFT, HARPOONS, ETC.—Continued.

118. Earliest types of hand-lances, formerly exclusively used for killing Whales, the past and present forms of the lances for killing Seal, Sea-elephant, and Walrus, the old-fashioned, non-explosive gun-lance, and the bomb-lance, darting-bomb, and rocket-bomb of the present. Also an example of the first bomb-lance, according to the records of the United States Patent Office, patented in this country for killing Whales. Two forms of the explosive harpoons, which may be thrust by hand, and one form intended to be used in connection with an improved pivot gun. An explosive hand-lance, several bomb-lances that have been cut from dead Whales, some of which failed to explode, others being exploded and represented by fragments.

XXIX.—CUTTING GEAR.

119. A series of implements known comprehensively as cutting-gear and try-works gear, arranged on and about a pyramidal wooden framework, from the center of which the blubber-tackle is suspended. A cutting stage is rigged at the right; upon it is placed a lay figure, life-size, representing an officer in the act of cutting the blubber from the whale. Two long slabs of baleen cross each other near the top in the central front, and boat waifs are placed at the right and left corners. Various long-handled implements, including the cutting spades, head-spades, skimmers, and bailers, are arranged in frames at the rear. The heavy chains and toggles used for fastening the whale to the vessel, and for hoisting in the blubber, are placed about the base. The superstructure consists of a main royal pole, lookout bows, an American ensign, carried by a whaler during a cruise in Hudson's Bay, and a figure of a petty officer standing upon the cross-trees, with a marine glass at his eye, on the lookout for whales.

XXX.—ABORIGINAL WHALING AND SEALING APPARATUS.

120. A series of whaling apparatus used by the Indians of Cape Flattery, Washington Territory, including the harpoon-staff, harpoon, and lanyards, the lance-pole and lances, the sealskin buoys, and tow-ropes made of the fibers of spruce roots.

SECTION F.—APPARATUS USED IN THE WHALING AND SEALING INDUSTRY.

XXX.—ABORIGINAL WHALING, ETC.—Continued.

121. Harpoons and lances employed in whaling and sealing by the Eskimo of Alaska, and the Hudson Bay region.

SECTION G.—FISHERY PRODUCTS AND THEIR PREPARATION.

XXXI.—APPARATUS AND MATERIALS USED IN THE PREPARATION AND CARE OF PRODUCTS.

122. Fish cars and other floating cages for aquatic animals, including model of fish-marketman's car for the preservation of living fish; model of fish-car towed by the smack for keeping the catch alive; live-car, full size, for keeping fish alive; model of lobster-car for keeping live lobsters.

123. Ice-crusher, ice-picks, and tools used in handling ice in packing fresh fish for market, or storing them in the vessel's hold; model of refrigerator for preserving fish.

124. Model of fish wharf, with all the appliances for handling and curing dry fish, including scales for weighing, butts for pickling, flakes for drying, &c.; models of tilting and brush flakes; model of smoke-house for curing herring; models of sardine factory at Camden, Maine, showing the interior arrangements of tables, elevators, &c.; model of lobster-boiling house at Boston, showing the vats for steaming the lobsters, the wharf, and the derricks used in handling the lobsters. It is accompanied by models of lobster smacks and of the principal forms of lobster nets. Model of menhaden oil and guano factory, showing the apparatus by means of which the oil and guano are prepared. Model of fishery at Waukegan, Illinois, showing the apparatus employed in cleaning and salting down lake white-fish.

125. Apparatus used in the preparation of boneless fish, including mitre boxes, knives, cutting tables, box-nailing machine, nape-hooks, &c. Brand used by inspectors for marking barrels of pickled fish; oil bags, dippers, and other implements used in the manufacture of cod-liver oil; model of guano mixer, employed in the fish-guano works for the purpose of thorougly mixing the fish-scrap with the mineral phosphate and sulphuric acid.

SECTION G.—FISHERY PRODUCTS AND THEIR PREPARATION.

XXXI.—APPARATUS AND MATERIALS, ETC.—Continued.

126. Collection of cans, boxes, bags, and barrels for packing and transporting fish and oysters; box ends, sides, and covers, printed with the brands of boneless fish.

127. Samples of varieties of salt used in curing fish; exhibit showing the manufacture of cotton-seed oil, used to a considerable extent instead of olive oil for sardines, &c.

128. Several series of 30 by 40 inch photographs, showing the manner of handling and curing fish, landing from the vessels, drying, pickling, smoking, &c.; also showing the interior arrangements of canning factories, boneless-fish factories, &c.

129. Models of apparatus used in steaming oysters.

XXXII.—PRODUCTS OF THE FISHERIES PREPARED FOR FOOD.

130. Dry salted or plain dried preparations, including whole and boneless codfish and other species. Whale sinew used for food by the Chinese of California; dried meats of Abalone; Indian food, including dried Smelts, Salmon, Prawns, Shrimp, Cuttle Fish, Clams, &c.; Irish moss, &c.

131. Smoked preparations, including Halibut, Herring, Mackerel, Bluefish, White-fish, Salmon, Sturgeon, and Haddock, also varieties of fish prepared by the Indians and Eskimo.

132. Pickle or brine salted preparations, including Mackerel, Herring, Caviare, &c.

133. Preparations in spices, vinegar, &c., including Sardines, in mustard and tomatoes, Eels in jelly, Mackerel and Ocean Trout in mustard and tomato sauce, &c.

134. Preparations in oil, including American Sardines, &c.

135. Cooked preparations in cans, including fresh Codfish, Mackerel, Herring, Bluefish, Sea Bass, Ocean Trout, Salmon, fish and clam chowders, Lobsters, Clams, Oysters, Shrimps, &c.

136. Samples of crude, half bleached and bleached Irish moss (*Chondrus crispus*), used for gelatine.

XXXIII.—PRODUCTS OF THE FISHERIES USED FOR CLOTHING.

137. Mammal furs, including skins of fur-seal, sea-otter, &c., used for muffs, gloves, collars, cuffs, and trimmings.

SECTION G.—FISHERY RPODUCTS AND THEIR PREPARATION.

XXXIV.—MATERIALS EMPLOYED IN THE ARTS AND MANUFACTURES.

138. Ivory of mammals, including tusks of Walrus used for trinkets, handles, jewelry, buttons, paper-knives, counters, &c.; ivory of Narwhal (*Monodon monoceros*), used for canes; teeth of Sperm Whale (*Physeter macrocephalus*) and their application to the manufacture of balls, buttons, and trinkets.

139. Ivory of reptiles; teeth of Alligator, used for jewelry, whistles, cane-handles, buttons, &c. An extensive trade in Alligator teeth is carried on in Eastern Florida, several establishments being there engaged in their manufacture into fancy articles.

140. Bone of Mammals, including Sperm Whale, jaw-bone made into harness-rings, martingales, sail thimbles, pulley-blocks, seine-needles, chopping-knife, &c; "Os mirabilis" of Walrus, used for charms, &c.; bone of fishes, including sword of Swordfish (*Xiphias gladius*).

141. Baleen, or whalebone, crude and prepared, for various uses. This collection includes slabs of whalebone of Bowhead Whale (*Balæna mysticetus*), Northwest coast Right Whale (*Eubalæna Sieboldii*), Humpback Whale (*Megaptera versabilis*), Sulphur-bottom Whale (*Sibbaldius sulfureus*), California Gray Whale (*Rhachianectes glaucus*), and other species; strips of bone prepared by the Eskimo; also whalebone in condition to be used in the manufacture of whips, brushes, hats, caps, canes, corsets, and numerous other articles.

142. Tortoise shell (*Eretmochelys squamata*) and commercial tortoise shell used in manufacture of combs, knife handles, and other articles.

143. Scales of fishes used in ornamental work, with specimens of flowers and other articles manufactured therefrom.

144. Pearls and nacre, embracing the pearl-yielding shells, with the pearls and the mother-o'-pearl in the rough state, with the manufactured buttons, handles, and jewelry, pearl-powder, inlaid work, and *papier-mâché*, ornamented with mother-o'-pearl; ear-shells (*Haliotidæ*) used in manufacture of buttons, handles, inlaid work, and pearl powder; Pearl Oysters (*Aviculidæ*), with pearls and nacre; River Mussels (*Unionidæ*), with pearls and nacre, crude and polished.

SECTION G.—FISHERY PRODUCTS AND THEIR PREPARATION.

XXXIV.—MATERIALS EMPLOYED, ETC.—Continued.

145. Cameo shell and shells of *Cypræa*, *Rotella*, *Oliva*, *Turritella*, &c., mounted as buttons and jewelry, composition shell work for box covers and frames, made by gluing shells in mosaic; cuttle-fish bone from *Sepia officinalis*, used as a pounce, as a dentifrice, as polishing powders, for taking fine impressions in counterfeiting, and as food for birds; concretions from the stomach of *Astacus*, known as "crab's-eyes" and "crab-stones," and used as antacids; shell of king-crab (*Limulus Polyphemus*), used as a boat-bailer.

146. Alligator leather (*Alligator mississippiensis*), salted and tanned, and manufactured into satchels, slippers, boots, &c. (See exhibit of Tiffany & Co. and H. J. Mahrenholz.) Skins of Eels (*Anguilla vulgaris*), Sturgeon (*Acipenser rubicundus*), Cod (*Gadus morrhua*), Hake (*Phycis chuss*), Cusk (*Brosmius brosme*), and other species, crude, and manufactured into shoes, isinglass, &c. (See exhibits of Gloucester Isinglass and Glue Co. and Russia Cement Co.)

147. Isinglass (*ichthyocolla*), made from air-bladders and skins of fishes and used in the manufacture of fine glues and sizes, adhesive and court plasters, diamond cement, imitation glass, and table-jelly and confectionery, in refining wines and liquors, in adulterating milk, in fixing the luster of artificial pearls, and in lustering silk ribbons (embracing the dried and the manufactured products) in their grades of "lyre," "heart-shaped," "leaf," and "book" isinglass. Hard and liquid fish-glue made from skins of Cod, Cusk, Hake, and other species; carriage axle, hats, oil-cloths, spools, &c., in the manufacture of whichfish-glue is used. (See exhibits of Gloucester Isinglass and Glue Co. and Russia Cement Co.)

148. Specimens of American commercial sponges. (See Invertebrate exhibit.)

149. Oils and fats, including Seal oil in its various grades, used for lubricating; Sea Elephant oil, crude and bleached; oil from body of Whales, Grampuses, and Porpoises, used in the arts, for lubricating, painting, &c.; Blackfish and Porpoise jaw oil, used in lubricating fine machinery, watches, clocks, and guns; Grampus oil, used for lubricating fine machinery; crude and refined Sperm oil, used for illuminating, lubricating, as an

SECTION G.—FISHERY PRODUCTS AND THEIR PREPARATION.

XXXIV.—MATERIALS EMPLOYED, ETC.—Continued.

emollient in medicine, for lip-salves, and in the manufacture of spermaceti; crude and refined spermaceti, with samples of candles from it; Alligator oil, made in Florida; oil from various species of fish, as Sunfish (*Mola rotunda*), currier's cod-liver oil, medicinal cod-liver oil; stearine from liver-oil of codfish; oil from liver of Cusk (*Brosmius brosme*), Haddock (*Melanogrammus æglefinus*), Pollock (*Pollachius virens*), &c.; Menhaden oil, used in currying leather, in rope-making, for lubricating, for adulterating linseed oil, as a paint oil, and exported to Europe for use in the manufacture of soap and for smearing sheep; Oulachan oil, used by the Indians of the Northwest coast for food and illumination; oil of Squid (*Ommastrephes illecebrosa.*)

150. Mammal perfumes; ambergris from sperm whale, used in the preparation of fine perfumery.

151. Chemical products and agents employed in the arts and medicine; fluid extract of seawrack (*Fucus vesiculosus*), sold under the name of "antifat."

152. Fertilizers in the preparation of which fish are used, including Menhaden guano, crude and ground, guano made from fish skins, and from fish heads and bones. Series of preparations illustrating the manufacture of soluble Pacific guano, including crude and crushed, and ground South Carolina phosphates; crude Navassa phosphate, Sicily sulphur for the manufacture of sulphuric acid; Stassfurth kainite, used in preservation of scrap, crude Menhaden scrap, and scrap dried by the Hogle patent drying machine.—(See exhibits of Quinnipiac Fertilizer Company, The George W. Miles Company, Winfield S. Dunan, W. A. Abbe, and others.)

SECTION H.—FISH CULTURE.

XXXV.—APPARATUS AND METHODS OF FISH CULTURE.

153. A map showing the operations of the United States Fish Commission from 1871 to the present time, the location of the hatching stations belonging to the United States Fish Commission, and to the Fish Commissions of the several States; and the dates of the establishment of the State Commissions. It also shows the locations where young fish have been planted, each species being designated by a peculiar symbol.

SECTION H.—FISH CULTURE.

XXXV.—APPARATUS AND METHODS, ETC.—Continued.

LIST OF HATCHING STATIONS.

The following is a list of the hatching stations operated by the United States Fish Commission in 1883:

1. Grand Lake Stream, Maine, station for collecting eggs of the Schoodic Salmon (*Salmo salar* var. *sebago*).
2. Bucksport, Me., station for collecting and hatchind eggs of the Atlantic Salmon (*Salmo salar*), and for hatching eggs of White-fish (*Coregonus clupeiformis*) to be distributed in the waters of the State.
3. Wood's Holl, Mass. Permanent coast-station, which serves as a basis of operation for the scientific investigations of the Commission, and as a hatching station for eggs of the Cod (*Gadus morrhua*) and other sea-fishes.
4. Cold Springs Harbor, Long Island, New York. Station for hatching eggs of various species of Salmonidæ for distribution in New York and vicinity.
5. Havre de Grace, Maryland, Station located on Battery Island, in the Susquehanna River, for the purpose of collecting and hatching eggs of the Shad (*Clupea sapidissima*).
6. Washington, District of Columbia.
   - *a.* National Carp ponds. Ponds for the propagation of the three varieties of the Carp (*Cyprinus carpio*), and the Gold-fish (*Carassius auratus*), the Golden Ide (*Idus melanotus* var. *auratus*), and the Tench (*Tinca vulgaris*).
   - *b.* Arsenal ponds. Ponds for the propagation of Carp (*Cyprinus carpio*).
   - *c.* Navy Yard. Station for collecting and hatching eggs of the Shad (*Clupea sapidissima*).
   - *d.* Central hatching station. A station fully equipped for scientific experiments connected with the propagation of fishes. The station is also provided with apparatus for hatching the eggs of all of the more important species, including light,

SECTION H.—FISH CULTURE.

XXXV.—APPARATUS AND METHODS, ETC.—Continued.

LIST OF HATCHING STATIONS—Continued.

heavy, and adhesive eggs. It is the principal distributing station of the Fish Commission, for both eggs and young fish to all portions of the United States.

7. Wytheville, Virginia. A station for hatching eggs of Brook-trout (*Salvelinus fontinalis*) and California Trout (*Salmo irideus*).
8. Saint Jerome's Creek, Point Lookout, Maryland. A station for the artificial propagation of the Oyster (*Ostrea virginiana*), the Spanish Mackerel (*Scomberomorus maculatus*), and the Banded Porgy (*Chætodipterus faber*).
9. Avoca, North Carolina. A station on Albemarle Sound, at the junction of Roanoke and Chowan Rivers, for collecting, hatching, and distributing eggs of the Shad (*Clupea sapidissima*), Alewife (*Clupea vernalis* and *æstivalis*), and Striped Bass (*Roccus saxatilis*).
10. Northville, Michigan. A hatching station for the development and distribution of eggs of the White-fish (*Coregonus clupeiformis*). This station is also provided with tanks and ponds for the spawning, hatching, and rearing of Brook-trout (*Salvelinus fontinalis*) and California Trout (*Salmo irideus*).
11. Alpena, Michigan. A station for the collection and development of the eggs of the White-fish (*Coregonus clupeiformis*).
12. Baird, California.
    a. Salmon station. A station on the McCloud River for the development and distribution of eggs of the California Salmon (*Oncorhynchus chouicha*).
    b. Trout ponds. A station near Baird for collecting, developing, and distributing eggs of the California Trout (*Salmo irideus*).
13. Clackamas River, Oregon. A station on Columbia River for collecting and hatching eggs of the California Salmon (*Oncorhynchus chouicha*).

SECTION H.—FISH CULTURE.

XXXV.—APPARATUS AND METHODS, ETC.—Continued.

LIST OF HATCHING STATIONS—Continued.

154. Hatching table, in three parts, showing small sized models of the various kinds of hatching apparatus used in the United States, in actual working order, the water to be supplied by means of a gas pumping engine which forces it into closed pipes with a pressure of 15 pounds to the square inch. Stop-cocks are placed at frequent intervals in these pipes and are connected with the hatching apparatus by means of rubber tubing. The apparatus is supplied with natural and artificial eggs to get a better idea of its working. The first compartment contains the closed apparatus, the next the trough and other apparatus requiring running water, while the third is arranged as a basin or artificial lake for showing the floating apparatus and other kinds used in open streams. A McDonald fish-way is placed at the end of the trough to conduct the waste water to the tank below, from which it is again carried to the pump.

155. A plaster cast representing a man in the act of taking eggs from an Atlantic salmon in a pan in which they are to be impregnated. By his side are casts of a ripe male and female salmon with the abdominal walls removed to show the ovaries and spermaries in position.

156. A model of the United States Fish Commission steamer Fish Hawk, built by Pusey & Jones, of Wilmington, Delaware.

157. Sectional model of the United States Fish Commission steamer Fish Hawk, on a scale of two inches to the foot, showing the hatching deck properly equipped with fish-hatching apparatus and the arrangement of hatching boxes on the outer side.

158. Models of several of the most important hatching houses in the United States, including the following:

Model of hatching house built at Druid Hill Park, Baltimore, Maryland, in 1875, under the direction of Maj. T. B. Ferguson, then State Commissioner of Fisheries. The interior of this model is fitted up with miniature hatching apparatus, showing the arrangements for actual work. It contains Ferguson hatching jars, flights of Coste trays, Williamson hatching troughs, Clark hatching troughs, Holton hatching box, Green hatching box, aquaria, and reservoir tank provided with filters and porcelain-lined sinks.

SECTION H.—FISH CULTURE.

XXXV.—APPARATUS AND METHODS, ETC.—Continued.

LIST OF HATCHING STATIONS—Continued.

Model of hatching house at United States salmon-breeding station at Bucksport, Maine, built under the direction of Mr. Charles G. Atkins, with movable roof for showing the interior, which is provided with troughs for hatching eggs of the Salmon. The water enters the troughs through a feed trough along the side of the room and escapes by pipes through the floor.

Model of United States hatching house at Northville, Michigan, built under the direction of Mr. Frank N. Clark, for hatching eggs of Lake Trout, Brook Trout, California Trout, California Salmon, and Whitefish. The interior of this hatchery is provided with miniature hatching troughs and jars, while in the grounds adjacent are shown several of the tanks and fish-ponds.

159. Maps showing topography of the land adjacent to several of the more important hatching stations of the United States Fish Commission, including the national Carp ponds at Washington, District of Columbia, the United States reservation for fish-cultural purposes on the McCloud River, California, the salmon-breeding stations at Grand Lake Stream and Bucksport, Maine, and the hatching station at Northville, Michigan.

160. Series of 30 × 40 inch photographs, retouched with India ink, showing several of the more important hatching stations and the more interesting features of fish-cultural work, such as taking and impregnating the eggs, tagging the fish, and the process of manipulation of the eggs and young fish at the hatchery.

161. Series of fish-hatching apparatus, including all of the more important kinds used in the United States. Each specimen in this series is of actual size and in the condition ready for use.

162. Series of accessory apparatus used at fish-hatching stations such as pans, skimming-nets, pails, dippers, and lanterns.

163. Series of apparatus for the transportation of eggs and young fish, including all of the more important kinds now used by leading American fish culturists.

164. Series of fish eggs in alcohol. This series includes the eggs of about one hundred of the more important food-fishes taken within the limits of the United States.

SECTION H.—FISH CULTURE.

XXXVI.—EGGS AND YOUNG FISHES.

165. Series of fish-eggs showing daily development of the embryo from the unimpregnated eggs to the newly hatched fish. This series embraces all of the more important species hatched by the Fish Commission, including Brook Trout, Lake Trout, Atlantic Salmon, Schoodic Salmon, California Salmon, Rainbow Trout, Rangeley Trout, White-fish, Shad, Mackerel, Cod, Alewives, and Yellow Perch.

166. Series of young fish showing the rate of growth. This series includes the following species: Brook Trout, Rainbow Trout, California Salmon, Atlantic Salmon, White-fish, and Shad.

XXXVI.—FISH WAYS.

167. Models of all the more important styles of fish-way used in the United States, seventeen in number. Illustrations of the Shotwell process for cleansing streams from the refuse of gas factories.

XXXVII.—FISH CULTURISTS.

168. Photographs of State Fish Commissioners.

169. Photographs of officers and members of the American Fish Cultural Association and other representative fish culturists.

SECTION I.—INVESTIGATION OF THE WATERS AND RESEARCH.

XXXVIII. A.—DEEP-SEA RESEARCH.

170. A nearly complete series of the deep-sea sounding and dredging appliances, accessory apparatus, and instruments for physical observations, used by the United States Fish Commission, and United States Coast and Geodetic Survey. Models, photographs, and plans of the United States Fish Commission steamers Albatross and Fish Hawk. Series of plates illustrating the deep-sea sounding and dredging appliances of the United States Coast Survey steamer Blake.

171. Five relief models, showing the configuration of the sea bottom off the eastern coast of North America from Newfoundland to Mexico.

172. Chart, showing the dredging operations of the United States Fish Commission, 1871–1882.

SECTION I.—INVESTIGATION OF THE WATERS AND RESEARCH.

XXXVIII. A.—DEEP-SEA RESEARCH—Continued.

172*a*. Series of specimens of marine invertebrates, obtained from the deeper waters off the northeastern coast of the United States, since 1878, by the United States Fish Commission and Gloucester Fishing vessels, and representing some of the more interesting features of the fauna of that region. Specimens of rock formation from the deeper waters off the New England coast.

B.—INVESTIGATION OF THE FRESH WATERS.

172*b*. Collections of crayfish and fresh water sponges from the rivers of the United States.

SECTION K.—LITERATURE.

XXXIX.—BOOKS.

173. Publications of the United States Fish Commission.
Publications of the State Fish Commissions.
Publications of the United States Government relating to the fisheries.
Principal works of American writers on the marine and fresh water fauna of the United States, the geographical distribution, development, and life history of aquatic animals, and, in general, investigations upon seas, lakes, and rivers, and their inhabitants.

COLLECTIONS DISPLAYED

BY

SPECIAL EXHIBITORS.

COLLECTIONS DISPLAYED BY SPECIAL EXHIBITORS.*

W. A. ABBE, New Bedford, Massachusetts:

Samples of "Abbe's fish scrap." (29.)

1. Unground or crude menhaden scrap.
2. Fine ground menhaden scrap.
3. Very fine ground menhaden scrap.

MAYHEW ADAMS, Chilmark, Massachusetts:

Patent chock for whale-boat. (6.)

ALEXANDER AGASSIZ, Museum of Comparative Zoology, Cambridge, Massachusetts:

Publications relating to fishes and marine invertebrates. (60.) (See also Museum of Comparative Zoology, Cambridge.)

Plans of biological laboratory at Newport, Rhode Island. (40.)

STEPHEN H. AINSWORTH, New York:

Spawning-race for *Salmonidæ*. (35.)

ALASKA COMMERCIAL COMPANY, San Francisco, California:

Two Pacific walrus tusks. (32.)

One 41 inches long and weighing $12\frac{1}{4}$ pounds.

One 41 inches long and weighing $12\frac{1}{2}$ pounds.

Exhibit of fur-seal skins. (32.)

ALBANY BEEF PACKING COMPANY, 372 Greenwich street, New York City:

Fish oils and fertilizers. (29.)

Fish oil.

Fertilizers and bone dust.

Cooked preparations in cans. (26.)

Canned Sturgeon (called Albany Beef), one-pound cans.

CHARLES ALDEN, Randolph, Massachusetts:

Foods prepared by the Alden evaporating process. (26.)

J. A. ALLEN, Museum of Comparative Zoology, Cambridge, Massachusetts:

Maps illustrating the geographical distribution of the seals and walruses. (55.)

Monograph of the Pinnipeds of North America. (60.)

---

*The explanations in small type are usually in the words of the exhibitor, and should not be understood to have official indorsement.

F. S. ALLEN, New Bedford, Massachusetts:

Bomb-lances formerly used with the whaling rifle, and other implements used in the whale fishery. (1.)

FREDERICK S. ALLEN, Cuttyhunk, Massachusetts:

Model of Life-Raft (patented April 26, 1881). (6.)

Made of frames attached to empty casks, provided with oars, masts, tent, &c. "The strings attached to the man-holes are to be lashed across to prevent anything from coming out."

Model of hand-capstan or windlass. (6.)

Made with one double-acting lever and adapted for weighing anchors, hauling vessels from shores when stranded, setting up rigging, &c.

Model of hand-capstan. (6.)

The brakes can always be hinged for action so that in the darkest night there need be no delay in revolving the capstan. The capstan is simple in construction and can be easily repaired.

Model of capstan or windlass. (6.)

Has two levers and is especially adapted to fishing vessels. The power can be applied to two teeth of the ratchet at the same time by the links on the push pawls of the levers.

Sword-fish iron. Improved pattern. (6.)

When the movable catch that holds the toggle strikes the skin of the fish it unlocks the iron, but, nevertheless, will remain in position as long as it continues going. When the action is reversed or the iron drawn out, it immediately toggles or comes crossways. The long shank can then be easily pulled out of the short shank by means of a small line attached.

THE AMERICAN ANGLER, New York City:

File of "The American Angler." (60.)

THE AMERICAN FIELD, Western office 155 and 157 Dearborn street, Chicago, Illinois:

Bound volume of the American Field. (60.)

AMERICAN FISH-CULTURAL ASSOCIATION, New York City:

Annual reports and *menus* of annual dinners. (60.)

Portraits of its members. (57.)

AMERICAN NET AND TWINE COMPANY, Boston, Massachusetts:

Exhibit of Nets and Seines, and Twine used in their manufacture. (1 and 8.)

One Baird Seine, all fitted.

One Minnow Seine, all fitted.

One River Seine, all fitted.

One Herring Net, 30 rows by 150 meshes, 2½-inch, 14–6, Barked, Noselled, and Roped.

One Herring Net, 30 rows by 150 meshes, 2½-inch, 10–4, Barked, Noselled, and Roped.

AMERICAN NET AND TWINE COMPANY, Boston, Massachusetts:

Exhibit of Nets and Seines, etc.—Continued.

One Mackerel Purse Seine.
One Herring Purse Seine.
One Barked Web, 2-inch, 20–6, Hall Twine.
One Barked Web, 2-inch, 9 thread, half patent-laid Twine.
One Barked Web, 2-inch, 18 thread, half patent-laid Twine.
One Web, 300 yards long, 2½-inch, 9 thread, half patent-laid Twine, colored red.
One Web, 300 yards long, 2½-inch, 9 thread, half patent-laid Twine, colored blue.
One Web, 1,000 yards long, 3-inch mesh, 12 thread, half patent.
One Web, 300 yards long, 3-inch mesh, 18 thread, half patent.
One River Seine, 100 feet long, 8 by 10 feet deep, 2½-inch mesh, 12½ patent Twine, Barked and fitted complete.

Pieces of Netting in Web, as follows:

One piece, 100 yards long by 150 meshes deep, 2-inch, 20–6, Hall Twine.
One piece, 100 yards long by 150 meshes deep, 2½-inch, 14–6, Hawser Twine.
One piece, 100 yards long by 150 meshes deep, 2-inch, 9, half-patent Twine.
One piece, 100 yards long by 150 meshes deep, 2-inch, 6, half-patent Twine.
One piece, 100 yards long by 100 meshes deep, 3-inch, 12, half-patent Twine.
One piece, 100 yards long by 150 meshes deep, 2½-inch, 10–4, Hawser Twine.
One piece, 100 yards long by 150 meshes deep, 2¼-inch, 20–5, Hawser Twine.
One piece, 100 yards long by 150 meshes deep, 2⅝-inch, 20–12, Cable Twine.
One piece, 100 yards long by 150 meshes deep, 3-inch, 20–9, Cable Twine.
One piece, 100 yards long by 150 meshes deep, 2½-inch, 15–9, half-patent Twine.

Samples of Twine:

One bundle each of 6, 9, 12, 15, 18, 21, 24, 27, 30, and 36 threads, half-patent (bundles not papered).
One bundle half-patent Twine. (Papered.)
Two bundles each of 20–6 and 20–12, Hall Twine, 20–6 and 20–9 Cable-laid Twine. (One bundle of each kind papered and one unpapered.)
Two sample boards of patent-laid, soft-laid, and Net Twines.

AMERICAN SHIP WINDLASS COMPANY, Providence, Rhode Island:

Working model of the Providence steam capstan windlass. (6.)

MAX AMS, 372 and 374 Greenwich Street, New York City:

Preparations in spices and vinegar, &c. (26.)

Eels in jelly, in cans.

Smoked preparations. (26.)

Smoked Eels.

Pickle or brine salted preparations. (27.)

American Caviare (Sturgeon roe).

Cooked preparations in cans. (26.)

Canned Sturgeon (called Albany Beef).

JAMES ANNIN, Jr., Caledonia, New York:

Box for the transportation of fish ova. (35.)

Case containing 3,000 living eggs of the Brook Trout (*Salvelinus fontinalis*). (36.)

CHARLES G. ATKINS, Bucksport, Maine:

Apparatus used in the artificial propagation of various species of *Salmonidæ*. (35.)

Series of eggs and young of Atlantic Salmon, showing daily growth from the newly-impregnated egg to the fry several weeks old. (36.)

Model of Pike's spiral fish-way, with modifications; also model of Atkins's Bangor fish-way. (37.)

ATWOOD BROTHERS, Clayton, New York:

Working model of Atwood's patent center-board for boats and canoes. (6.)

BADOLLET & CO., and TILLAMOOK PACKING COMPANY, Astoria, Oregon:

Cooked preparations in cans. (26.)

Canned salmon.

BAGNALL & LOUD, Boston, Massachusetts:

Harcourt's patent improved inside iron-strapped block. (6.)

"This improvement consists in having a solid partition in a double or triple block, and having four straps in a double and six in a triple block, each strap being let into each side of every partition."

Sheave-roller bushing. (6.)

"The rolls revolve on a sleeve or second pin, which in halyard blocks is one and one-half inches in diameter in place of three-quarter inch, thus giving a large bearing for the rolls to revolve on, the wear on the pin in the block being little, if any."

Lug-roller bushing. (6.)

"The washer being flexible, will stay in its place until the rolls are entirely worn out, which is not the case with the old style of roller bushing."

BAGNALL AND LOUD, Boston, Massachusetts:

Improved lug-roller with iron sheave. (6.)

Gaff-topsail cleat and downhaul attachment. (6.)

"The advantages are first in a swinging cleat which will always have a fair lead, and can be applied either to the port or starboard side as well. In connection with the cleat is the band on the gaff and downhaul attachment, consisting of a brass bull's eye, all being easily applied in one piece to the gaff by one bolt."

Improved snatch-block. (6.)

"The outside straps are fastened at the end of the block by a bolt, which prevents the sides of the block from pinching the sheave. To lock and unlock the fastening is very easily accomplished by turning the block or hook to right angles, thus bringing the link even with the lip, which then is slipped off, the rope inserted, and the link replaced. This does away with the bolt and chain."

Leader for peak halyards. (6.)

Used on the cross-trees. "A new and useful attachment."

Improved sheet-block with boom buffer combined. (6.)

"Has rubber cushions at its upper and lower ends, which are intended to ease off the strain when the boom jibes over suddenly. Intended to hang on the boom."

Improved trawl roller. (6.)

"The improvement consists in having the spindle securely fastened to the roll, and having the outer ends revolve in a box at each end of the roll. The box is made of composition and provided with a lubricant for the spindle to run in."

Improved seine block. (6.)

ARTHUR H. BAILEY & CO., Boston, Massachusetts:

Cooked preparations in cans. (26.)

Fresh Bluefish, one-pound cans.
Fresh Sea Bass, one-pound cans.
Fresh Mackerel, one-pound cans.
Fresh Deep-Sea Salmon, one-pound cans.
Ocean Trout.

Smoked preparations. (26.)

Finnan Haddies, one-pound cans.
Kippered Herring, one-pound cans.

Preparations in Spices, Vinegar, &c. (26.)

Mackerel in Mustard Sauce, two-pound cans.
Mackerel in Tomato Sauce, two-pound cans.
Ocean Trout in Mustard Sauce, two-pound cans.
Ocean Trout in Tomato Sauce, two-pound cans.
Nantucket Sturgeon in Piccalilli Dressing, two-pound cans.

Dummy cans to show various brands of canned goods.

PASSED ASSISTANT ENGINEER WILLIAM L. BAILIE, U. S. N., Steamer Fish-Hawk:

Improved metal case for Negretti and Zambra deep-sea thermometer. (40.)

BENJAMIN BAKER, 2d, New Bedford, Massachusetts:

One lobster-pot. (2.)

J. H. BARTLETT & SONS, New Bedford, Massachusetts:

Full size whale-boat, rigged for use. (4.)
Crude and refined whale oils. (29.)
Arctic and Humpback Whale bone. (32.)

JOHN BARTLETT, Cambridge, Massachusetts:

Bibliography of angling. (60.)

JAMES BARTON, New Bedford, Masssachusetts:

Implements used in the capture of the whale. (1.)

J. W. BEARDSLEY'S SONS, 179 West Street, New York City:

Dry salted preparations. (26.)
Beardsley's shredded Codfish.
Boneless Codfish, Beehive brand.
Boneless Herring, Star brand.

TARLETON H. BEAN, United States National Museum, Washington:

Map showing geographical distribution of the *Salmonidæ* of Alaska, (55.)
Publications on ichthyology and the fisheries. (60.)

JAMES BEETLE, New Bedford, Massachusetts:

Live car for tautoging. (33.)
Implements used in the whale-fishery, in frost fishing, and blue fishing. (1.)
(Mr. Beetle also made the model of whale-boat.)

RUDOLPHUS BEETLE, New Bedford, Massachusetts:

Dried frog, taken from a whaleman's molasses cask. (52.)

J. E. BENEDICT, United States Steamer Albatross:

Rake-dredge for collecting Annelids and other mud-burrowing invertebrates. (40.)

EUGENE G. BLACKFORD, New York Fish Commissioner, Fulton Market, New York City:

Fresh food-fish on ice. (51.)

JOHN BLISS & CO., New York City:

Nautical instruments. (6.)
1. Taffrail log. (Complete.)
2. Parallel rules; two sizes, new style.

A. BOOTH, Baltimore, Maryland; Chicago, Illinois; and Astoria, Oregon:

Preparations in Spices and Vinegar, &c. (26.)
Oysters in glass.
Cooked preparations in cans. (26.)
Canned Oysters. (Oval brand.)
Canned Salmon. (Oval brand.)
Labels, cards, and empty cans, showing brands of oysters and salmon. (25.)
Refrigerator for oysters. (25.)

JONATHAN BOURNE, New Bedford, Massachusetts:

Series of implements used in the whale-fishery. (1.)

E. A. BRACKETT, Winchester, Massachusetts:

Model of fish-way, with partitions at right angles, provided with a submerged piece of cob-work, surmounted by grating, to direct the fish to the mouth of the way. (37.)
Floating box for use in open stream. (35.)

WALTER M. BRACKETT, Boston, Massachusetts:

Crayons and paintings of fish. (51.)

JUNIUS A. BRAND, Norwich, Connecticut:

Bomb-lances and darting-bomb for killing whales. (1.)

JAMES D. BREWER, Muncy, Pennsylvania:

Model of fish-way, with transverse sloping floors; also model of oblique groove fish-way. (37.)

JAMES TEMPLE. BROWN, United States National Museum, Washington:

Collection of whaling harpoons, lances, guns, bombs, &c., gathered for the Fish Commission at New Bedford in 1882. (The entire whaling collection has been arranged by Mr. Brown.) (1.)

BRUSH SWAN ELECTRIC LIGHT COMPANY, New York City:

Apparatus for enlarging photographs. (51.)
(Used by Mr. T. W. Smillie in preparing the series of photographs illustrative of the fisheries, but not exhibited.)

OLIVER N. BRYAN, Occokeek, Maryland:

Floating hatching-box for use in open stream. (35.)

BURNHAM & MORRILL, Portland, Maine:

Smoked Preparations. (26.)
Finnan Haddies, in 1-pound cans.
Cooked preparations in cans. (26.)
Canned Lobsters, 1-pound flat cans.
Canned Lobsters, 1-pound tall cans.
Canned Mackerel, 1-pound cans.
Canned Clams, 1-pound cans.

J. T. BUTTRICK, New Bedford, Massachusetts:

Ship bread carried by whalemen. (22.)

CHARLES CARPENTER, Kelley's Island, Ohio:

Camel's-back buoy. (6.)

CASTINE PACKING COMPANY, Castine, Maine:

Cooked preparations in cans. (26.)

Canned Lobsters in 1-pound and 2-pound cans, one dozen each.
Canned Mackerel, one dozen 1-pound cans.
Canned Soused Mackerel, No. 4, one dozen cans.
Canned Halibut, No. 5, one dozen cans.
Canned Clams in 1-pound and 2-pound cans, one dozen each.
Canned Clam Chowder, one dozen 3-pound cans.

Pickle or Brine-Salted Preparations. (26.)

No. 5 Mess Mackerel, one dozen cans.

THE CENTURY COMPANY, New York City, Art Department, A. W. Drake, Superintendent.

Original sketches from which were engraved the illustrations of the *Century* article upon the United States Life-Saving Service. (9.)

1. Off to a wreck.
2. Life-saving station.
3. Drill, &c., in surf-boat.
4. Launching surf-boat.
5. Night patrol.
6. Burning a signal.
7. Hauling mortar-car.
8. Surfman with life-belt.
9. Firing the mortar.
10. Breeches-buoy in operation.
11. Breeches-buoy.
12. Self-righting life-boat.
13. Self-righting life-boat under sail.
14. Life-saving dress.
15. Tally-board and whip-block.
16. Resuscitation, ejecting water.
17. Resuscitation, restoring respiration.
18. Medicine chest.
19. Mess-room.

Other sketches for illustration of marine subjects.

1. A glimpse of the sun.
2. Hove to for a pilot.
3. Launching the boat.
4. Taking a Porpoise aboard.
5. Sebatis in a perilous condition.
6. Beaching the canoe.
7. Reefing the mainsail.

A. J. CHASE, Boston, Massachusetts:

Chase's Cold Blast Refrigerator. (33.)

"This scientific system of refrigerating with ice, or ice and salt, or other freezing mixture, is the invention of Andrew J. Chase, of Boston, Massachusetts. It has been in use now five years. The strong points of this system are claimed to lie in the fact that it is adapted to all purposes, as it gives any temperature from 24° below freezing to 42° above zero. The internal circulation of the air is very brisk and dry, a necessary condition for preserving perishable goods. Thus far this refrigerator has been used principally for heavy work, or upon a large scale. At this time there are about 2,000 cold-blast cars in use, transporting dressed beef from the West to all the principal cities and towns from Maine to New Orleans and Florida. Thirty-two large English steamships have been fitted for transporting fresh meats to Europe. These have a capacity ranging from 800 to 1,800 quarters of beef each. The leading hotels and markets of the States are also fitted with these important structures. Cold-blast preserving houses are getting very popular in all parts of the country. Boston has the largest one in the world, just finished. Fish dealers are beginning to see that the old slop and slime method of packing in ice must very soon give place to the dry handling. Mr. Chase makes contracts for putting up buildings with all the improved appliances, guaranteeing any temperature desired. He also makes a specialty of cooling and ventilating buildings or passenger cars."—(*From letter of A. J. Chase.*)

Chase's Monitor Display Refrigerator. (33.)

"This refrigerator is used by those who wish to display small goods, such as print butter, chops, steaks, and fish. It is very economical in the use of ice, costing but a few cents to run it during the day. It is made in three sizes at present prices, $15, $20, and $25. These may be used with ice and ice water, or with salt and ice, according to the temperature required."—(*From letter of A. J. Chase.*)

OREN M. CHASE, Detroit, Michigan:

A glass hatching jar, provided with a glass tube, by means of which the water is delivered at the bottom and allowed to pass upward through the eggs. (35.)

CAPTAIN H. C. CHESTER, Noank, Connecticut:

Walrus tusks scrimshawed, and frame made of walrus ivory. (32.)
Bucket and box used in hatching floating eggs. (35.)
Rake Dredge, and other apparatus used in deep-sea research. (40.)

A. HOWARD CLARK, United States National Museum, Washington:

Map illustrating the past and present locations of the whaling-grounds of the world; publications on fishery statistics. (55–60.)

FRANK N. CLARK, Northville, Michigan:

Series of eggs and young fish, showing development and growth, as follows: Brook Trout, Rainbow Trout, Schoodic Salmon, and White-fish. (36.)

FRANK N. CLARK, Northville, Michigan:

Various kinds of apparatus used in hatching White-fish and other species of *Salmonidæ;* also box for the transportation of fish ova. (35.)

JAMES B. CLARK, Chester, Connecticut:

Working model of W. N. Clark's patent rudder hanger. (6.)

HENRY CLAY, New Bedford, Massachusetts:

A "Nantucket Bell" for calling the watch on a whaling vessel. (6.)

J. W. COFFIN, Edgartown, Massachusetts:

Log-book. (6.)

CHARLES A. COLE, Scituate, Massachusetts:

Specimens of commercial carrageen, or Irish moss (*Chondrus crispus*). (32.)

a. Moss as it comes from the rocks.
b. Moss partly bleached.
c. Moss bleached for market.

LUTHER COLE, New Bedford, Massachusetts:

Nickel-plated whaling instruments. (1.)

A. S. COLLINS, Caledonia, New York:

Spawning race for *Salmonidæ.* (35.)

CAPTAIN J. W. COLLINS, Gloucester, Massachusetts:

Collins's improved adjustable marine drag. (6.)

Full size for fishing vessels. It consists of a strong iron hoop, jointed and braced, so that it can be folded and stowed away in small compass when not in use. To this is attached by interlocking hoops a heavy canvas bag, which will fill with water when thrown overboard and hold the vessel steady, nearly head to the sea and wind, and with only a moderate leeway. The drag, when in use, is secured to a hawser by a chain bridle, and can be suspended at any required depth by means of a buoy. A line is attached to the bottom of the drag, so that it can be tripped and easily hauled in when its use is no longer necessary. The advantages of this drag are that it is always ready for use, being easily adjusted in a few moments when needed; that it can be unrigged and stowed away when not in use; that it can be constructed at a moderate cost, and that it promises to secure the desired end much better than the drags ordinarily employed for the same purpose. Dimensions: Circumference of hoop, 18 feet; length of cross-bars (each), 5 feet 10½ inches; size of iron (hoop and bars), 1¼ inches; length of bridle chains (each), 5 feet; circumference of bag, 19 feet; depth, 4 feet; canvas No. 0, white cotton duck; buoy, 7-gallon keg; buoy line, 1½-inch manila rope, 10 fathoms long; tripping line, 2-inch manila rope, 25 fathoms long. This drag is used to insure the greater safety of vessels in heavy gales, and also to prevent them from drifting so rapidly to leeward, as they do when it is not employed. It is secured to a hawser or chain and paid out from a schooner's bow, the distance varying from 25 to 75 fathoms.—(*Collins.*)

CAPTAIN J. W. COLLINS, Gloucester, Massachusetts:

Collins's patent fog alarm. (6.)

This invention consists of an upright cylindrical bellows of stout grain leather, supported by and working upon three brass rods, which are fastened at the lower ends to a strong wooden pedestal, and the upper ends of which are secured by means of screw caps to a wooden top, to which also is attached the upper part of the bellows. This wooden top or cap-piece is surmounted by a brass cone, having a hole in its apex, into which is screwed a reed horn. The bellows is collapsed or distended by means of an iron lever working on a hinge attached to the wooden base. By moving this lever the air in the bellows is driven with great force through the horn at the top. A very heavy sound is obtained when a large horn is used, while a small horn can be blown to its fullest capacity with any slight exertion on the part of the operator. Dimensions: Diameter of base, 2 feet; thickness, 4 inches; diameter of wooden top, 19 inches; thickness, 1½ inches; diameter of bellows (No. 56955), 15 inches; height, 20 inches; height of brass cone, 6½ inches; diameter of cone (at base), 9 inches; thickness of brass rods, ⅝ of an inch; length of lever, 4 feet. This implement was originally designed for use on fishing vessels, especially such as are employed in the line-trawl fishery. In the latter fishery the men go out in dories long distances (one to three miles) from the schooners that are lying at anchor, and the prevalence of dense fogs in summer, and snow in winter, causes the loss of many fishermen, who go astray because they are unable to hear the horns which are ordinarily employed. The advantages of this fog alarm are that it can be heard farther than any horn now in use on sailing vessels (this having been proved by actual test at sea); that the material of which it is made, and the simplicity of its construction, render it less liable to get out of repair than other patent horns; that it may be at all times operated with comparatively slight physical exertion, and without any of the exhaustion that results from blowing a horn with the mouth; and finally, that it is adapted for use on all kinds and classes of vessels. (*Collins.*)

Nickle-plated fog horn. (6.)

Tin, nickle-plated, bell-mouth, fitted with large brass reed. Length (excusive of reed), 4 feet; diameter of mouth, 8 inches.

This horn is used on the bellows, and constitutes a portion of Collins's fog alarm.

Brass fog horn. (6.)

Bell-mouth, large brass reed at lower or small end. Length, 3½ feet; diameter of mouth, 6 inches.

Used on the bellows, and is part of Collins's fog alarm.

Tin fog horns. (6.)

Three horns, tin, ordinary mouth horns, adapted for use in the bellows of Collins's fog alarm; length of each, 3 feet 2 inches; diameter of mouth, 5½ inches.

Fog-horn reeds, &c. (6.)

One large brass reed 3½ inches long, 1½ inches wide; two small reeds and mouth-pieces for tin fog horns.

To be used to replace other reeds which may be lost or injured.

CAPTAIN J. W. COLLINS, Gloucester, Massachusetts:

Model of ideal fishing schooner. (4.) (See Collective Exhibit.)
Publications relating to the fisheries. (60.)

PAUL E. COLLINS, Boston, Massachusetts:

Oil painting, "Hand-line Mackerel-fishing off the New England coast." (1.)

CAPTAIN B. F. CONKLIN, Jamesport, New York:

Sketches illustrating the Menhaden fishery, including (57.)—

1. Setting the seine.
2. Hauling the seine.
3. Scooping out the fish.
4. Floating factory Algonquin.
5. Boats going out to fishing grounds.
6. Working to windward of shoal.
7. Encircling the school.
8. Pursing, and fish striking the seine.
9. A loaded carry-away boat in good breeze.
10. A big strike, &c.

D. CONNELL, Provincetown, Massachusetts:

Harpoon-bomb. (1.)

CONROY & BISSETT, 65 Fulton street, New York City:

1 Hexagonal split bamboo Salmon rod, german-silver mountings, 18 feet long. (14.)
1 Hexagonal split bamboo Grilse rod, german-silver mountings, 15 feet long. (14.)
1 Hexagonal split bamboo Trout and Black Bass fly rod, german-silver mountings, 12 feet long. (15.)
1 Hexagonal split bamboo Trout and Black Bass fly rod, german-silver mountings, 11 feet long. (15.)
1 Hexagonal split bamboo Saint Lawrence rod, german-silver mountings, 10 feet long. (15.)
1 Hexagonal split bamboo McGuiness' Black Bass rod, german-silver mountings, 11½ feet long. (15.)
1 Hexagonal split bamboo California general rod, making 3 distinct rods, german-silver mountings, 8½ to 12½ feet long. (15.)
1 Hexagonal split bamboo "Newport," or heavy Bass rod, ash butt, agate tube top. (15.)
1 Hexagonal split bamboo "Holberton" fly rod, 2 pieces, and short ash butt. The joints of this rod are contained in the landing-net handle; the butt and folding landing net can be carried in the angler's pocket. (15.)
1 Hexagonal split bamboo "Henshall" Black Bass minnow rod, 8½ to 9 feet long. (15.)

CONROY & BISSETT, 65 Fulton street, New York City:

1 Hexagonal split bamboo southern Bass or Weak-fish rod, 9 to 9½ feet long. (15.)

CAPTAIN CALEB COOK, Provincetown, Massachusetts:

Exhibit of crude and refined oils from Beluga, Porpoise, and Black-fish. Watch and clock oils prepared from jaw oil of Porpoise. (29.)

N. N. COOK, Provincetown, Massachusetts:

Pair of duck trousers worn by N. N. Cook when bitten by a shark. (21.)

STEPHEN COOK, Provincetown, Massachusetts:

Implements used in the capture of the whale. (1.)

H. & S. COOK & COMPANY, Provincetown, Massachusetts:

Builder's model of Grand Bank fishing schooner Lizzie W. Matheson. (4.)

PATRICK CUNNINGHAM, New Bedford, Massachusetts:

Wooden model of darting-gun, and explosive lances cut from dead whales. (1.)

CUTTING PACKING COMPANY, San Francisco, California:

Cooked preparations in cans. (26.)

Fresh Salmon from California, Oregon, and Alaska streams.

This exhibit contains Alaska Salmon, probably the first ever shipped abroad. One can contains one fish, live weight eighty-six pounds; dressed, sixty-five pounds; the largest on record on this coast; caught at the company's cannery, at the mouth of the Kusiloff River, Alaska, July 22, 1882. We began prospecting for runs for canning purposes in 1881, and being located as above found three varieties, called by us, for commercial purposes, King Fish, Silver Side Salmon, and Small Red Fish, all of which are fully equal to the varieties caught by us at our canneries in Oregon and California.—A. D. Cutler, of Cutting Packing Company.

CAPTAIN W. H. DALL, United States Coast Survey, Washington:

Map showing geographical distribution of fur-bearing animals of Alaska, charts and publications upon the hydrography, meteorology of the North Pacific, and upon its marine fauna. (55.)

FRANK E. DAVIS, Gloucester, Massachusetts:

Davis' Standard Rowlocks, in galvanized iron, plain brass and polished brass; twenty specimens. (6.)

DE BUTTS and DAGGETTS, Boston, Massachusetts:

Cooked preparations in cans. (26.)

Canned fish.

W. G. DELAWDER, Easton, Maryland:

Spawning-box for *Salmonidæ* and other fresh-water species. (35.)

A. W. DODD & COMPANY, Gloucester, Massachusetts:

Exhibit of fish oils, stearine, and guano. (27 and 29.)

Pure cod-liver oil for medicinal use.

This oil is steam-rendered by the best process known, from fresh and healthy Cod livers, and warranted perfectly pure.

Blackfish oil, refined for morocco.

Cod oil, "Newfoundland," for tanners' and curriers' use.

Cod oil, "Labrador," for tanners' and curriers' use.

Cod oil, "Grand Bank," for tanners' and curriers' use.

Cod oil, "Shore," for tanners' and curriers' use.

Menhaden oil, "cold pressed," for tanners' and curriers' use.

"Cod oil stearine," for tanners' or soap-makers' use.

"Menhaden oil stearine," for tanners' or soap-makers' use.

Fish guano.

J. T. DONNELL, Bath, Maine:

Cable used by fishing vessels. (5.)

J. W. DRESSER, Castine, Maine:

Cotton lines used for Cod and Mackerel; hand-lines and Cod and Halibut trawl-lines. (1.)

BENJAMIN F. DREW, Fairhaven, Massachusetts:

Armor said to be worn by natives of Marshall and Caroline groups of islands, South Pacific. (21.)

JAMES D. DRIGGS, New Bedford, Massachusetts:

Harpoon. (1.)

WINFIELD S. DUNAN, Baltimore, Maryland:

Exhibit of Menhaden oil and scrap. (29.)

1. Unground or crude Menhaden scrap; made of fish two years old and over, called large fish.
2. Ground Menhaden scrap; made from the same stock as No. 1.
3. Unground or crude Menhaden scrap; made of fish not over one year old, called small fish.
4. Ground Menhaden scrap; made of same stock as No. 3.
5. Samples of Menhaden oil; two qualities.

R. EDWARD EARLL, Washington, District of Columbia:

Series of eggs of Codfish, showing daily development from the unimpregnated egg to the time of hatching. (36.)

Publications relating to the fisheries, fishery statistics, and fish culture. (60.)

SELMAR EGGERS, Sr., New Bedford, Massachusetts:

An improved breech-loading whaling gun (deposited in part by S. Eggers and the U. S. Fish Commission). (1.)

SELMAR EGGERS, Jr., New Bedford, Massachusetts:

Improved frost-fish spear. (1.)

HENRY W. ELLIOTT, Washington, District of Columbia:

Series of water-color sketches, illustrating the fur-seal fisheries of Alaska. (1.)

Report upon the natural history of the fur seal and the seal fisheries of Alaska. (60.)

Sketches in India ink illustrating fisheries of various parts of the United States. (1.)

HENRY W. ELLIOTT and J. W. COLLINS:

Pictures of various scenes in the New England fisheries. (1.)

J. H. EMERTON, Peabody Museum, Yale College, New Haven, Connecticut:

Models of Giant Squid and Giant Octopus shown in the collective exhibit. (46.)

F. M. EVERLETH, Waldoboro, Maine:

Model of fish-way, with automatic float for regulating the supply of water. (37.)

JAMES L. EVERSON, Williamsburg, New York:

"Shadow canoe," with sails, for cruising, fishing, or hunting. (20.)

FAIRBANKS & COMPANY, New York City:

Scales used in weighing fish and in scientific investigation. (34.)

PROF. W. G. FARLOW, Harvard College, Cambridge, Massachusetts:

Collective exhibit of North American Algæ. (42.)

Investigations of the red algæ infesting dried fish, with specimens of red fish and red salt. (42.)

Publications upon algæ. (60.)

WALTER FAXON, Museum of Comparative Zoology, Cambridge, Massachusetts:

Publications upon marine invertebrates. (60.)

ALBERT FERGUSON, 65 Fulton street, New York City:

Anglers' Lanterns. (19.)

No. 1. Excelsior jack, dash, fishing lamp, and hand lantern, for night fishing and hunting and other purposes, with cap or cover for obscuring the light when necessary; burns kerosene oil.

ALBERT FERGUSON, 65 Fulton street, New York City:

Angler's Lanterns—Continued.

No. 1 A. Socket attachment for adjusting the lamp to a stick or pole in the bow of a boat or canoe.

No. 1 B. Fishing reflector for night fishing, and for reading and writing at night when in camp; is adjusted to the face of the lamp by the hinge pin, the cap or cover being first removed.

No. 1 C. Adjustable dash attachment by which the lamp can be applied to any shaped leather wagon dash, and to any part thereof.

No. 1 D. Adjustable bracket attachment used in place of the dash clamp, by which the lamp can be applied to a wooden wagon, dash, pillar, or bow of a top vehicle, side of a house, &c.

No. 2. Universal reflecting lamp, for night fishing and hunting and general illuminating purposes; combines head jack, boat jack, fishing lamp, camp lamp, dash lamp, belt lamp, and hand lantern, with cap or cover for obscuring the light when necessary; burns signal oil.

No. 2 A. Socket attachment for adjusting the lamp to a stick or pole in the bow of a boat or canoe.

No. 2 B. Fishing reflector for night fishing, and for reading and writing at night when in camp; is adjusted to the face of the lamp by the hinge pin, the cap or cover being first removed.

No. 2 C. Head attachment for adjusting the lamp to the front of the head—worn over the hat.

No. 2 D. Head attachment, for adjusting the lamp to the top of the head—worn over the hat.

No. 2 E. Adjustable dash attachment by which the lamp can be applied to any shaped leather wagon dash, and to any part thereof.

No. 2 F. Adjustable bracket attachment, used in place of the dash clamp, by which the lamp can be applied to a wooden wagon dash, pillar, or bow of a top vehicle, side of a house, &c. By means of the folding handles at the back, this lamp can be used as a hand lantern, and by means of the loop as catch, above the handles, the lamp can be hung in any desired position.

Prices: Excelsior jack lamp, including reflector and attachments, $7.75; universal lamp, with reflector and attachments, $10.25.

MAJOR T. B. FERGUSON, Assistant United States Fish Commissioner, Washington, District of Columbia:

Various kinds of apparatus used in hatching heavy eggs; also transportation case for young fish. (35.)

J. WALKER FEWKES, Museum of Comparative Zoology, Cambridge, Massachusetts:

Publications on marine invertebrates. (60.)

FOREST AND STREAM PUBLISHING COMPANY, 39 and 41 Park Row, New York City:

A series of nineteen bound volumes of the weekly paper Forest and Stream and Rod and Gun. (60.)

AL. FOSTER, New York City:

Placards advertising fishing excursions in the vicinity of New York. (3.)

MRS. CAPT. J. H. FREEMAN, Wellfleet, Massachusetts:

Crayon sketch of Mackerel. (51.)
Oil painting of Salmon Trout. (51.)

FULTON MARKET FISH-MONGERS' ASSOCIATION, New York City:

Portraits of its members. (57.)

MRS. E. A. GANNETT, Edgartown, Massachusetts:

Log-book. (6.)

JOHN D. S. GILES, Brig "George and Mary":

Dried potato carried in pocket during a sixteen months' voyage in Hudson Bay. (21.)

GLOUCESTER ISINGLASS & GLUE COMPANY, Gloucester, Massachusetts:

Exhibit of Liquid Isinglass for adhesive paper, labels, and envelopes; Isinglass for court plasters; Pure Fish Glues (hard and liquid, free from salt), for leather belting, roll cots, and card felting, &c. (29.)

Extracts from the Catalogue prepared by the Company.

No. 1. Sample of the stock that is selected for making glue just as it comes from the salt fish. The Cod and Cusk skins are preferred to any others as they contain a larger percentage of glue or isinglass. Last year there were about 1,500 tons of this kind of stock used in Gloucester for glue and isinglass, at a value of $15 per ton.

No. 2. Sample of Cod skins, after being cleaned and the salt removed, ready to be made into isinglass or liquid glue.

No. 3. Sample of Cusk skins, after being cleaned and the salt removed, ready to be made into glue.

No. 4. Sample of Hake skins, after the salt has been removed and cleaned. The percentage of glue is small in these skins. See samples of liquid and dry.

No. 5. Sample of Haddock skins prepared for glue. The percentage is small. See sample of liquid and dry.

No. 6. Sample of Pollock skins, after being cleaned and salt removed. The percentage is small. See sample.

GLOUCESTER ISINGLASS & GLUE COMPANY, Gloucester, Massachusetts:

Exhibit of Liquid Isinglass, etc.—Continued.

No. 7. Show case or frame, with rolls of colored isinglass made from the skins of Cod and Cusk.

Nos. 8 and 9. Samples of Cod and Cusk isinglass made from the skins. It is used in very large quantities in the United States for the manufacture of court-plaster. We are supplying all the manufacturers, and they produce no less than $50,000 worth of goods a year.

No. 10. Samples of dry fish glue made from Haddock, Hake, and Pollock skins.

No. 11. Samples of liquid isinglass or glue used for gummed paper labels and envelopes, from Cod skins.

No. 12. Sample of liquid isinglass, for the same use, made from Cusk skins.

No. 13. Sample of liquid isinglass made from Hake skins.

No. 14. Sample of liquid isinglass made from Haddock skins.

No. 15. Sample of liquid isinglass made from Pollock skins.

No. 16. Sample of our mucilage made from fish skins, for office and express uses.

No. 17. Sample book of gummed paper from the Dennison Manufacturing Company of Boston, Massachusetts, U. S. A. This was gummed with liquid isinglass. 10,000 reams of paper were used in the United States last year. The isinglass and labor on same would amount to $25,000, and the paper would cost as much more. After this it goes to the printer and is worked up into all kinds of labels, &c. E. W. Dennison, president Dennison Manufacturing Company, No. 19 Milk street, Boston, says: "We have used the liquid glue manufactured by the Gloucester Isinglass and Glue Company for the past six or seven years, and have found it constantly improving. We do not know of any substitute equal to it."

No. 18. Sample of scrap book wherein our liquid isinglass is used, from D. Slote & Co., of New York. They say: "Gentlemen: We take pleasure in bearing testimony to the excellent quality of the liquid isinglass manufactured by you under John S. Rogers' Patent Process. We have used it extensively and find it a very superior article.—Daniel Slote & Co., Blank Book Manufacturers, William street, New York."

No. 19. Sample of leather belting wherein our dry isinglass or glue is used. Messrs. I. B. Williams & Son, of Dover, New Hampshire, say: "We have used your isinglass in cement for our leather belting for the last five or six years, and find it superior to anything we ever used."

No. 20. Sample of sheet glue dried in pans, used in the manufacture of leather belting.

No. 21. Samples of card belting from parties that use our liquid isinglass.

No. 22. Sample of court-plaster from some of our customers. Dr. C. B. Robbins, of Worcester, Massachusetts, U. S. A., says: "We have used your isinglass, dry and liquid, for nearly seven years, and it is the best manufactured isinglass with which we are acquainted. It is satisfactory in every respect." A. S. Knights & Co., Boston, Massachusetts, U. S. A., say: "Having used your isinglass in the manufacture of our goods for the past six years, we consider it

GLOUCESTER ISINGLASS & GLUE COMPANY, Gloucester, Massachusetts:

Exhibit of Liquid Isinglass, etc.—Continued.

superior to anything in the market." M. S. Carpenter, M. D., of Mansfield, Massachusetts, says: "I think the isinglass manufactured by your company is the best made in this country. I shall continue to use it as long as it is kept up to its present high standard of excellence."

No. 23. Sample of Spurr's paper veneer put on wood with our liquid glue; also samples of same from Chas. W. Spurr, of Boston, Massachusetts.

No. 24. Sample of box work where our glue is used for putting on velvet and plush, from Geo. W. Brooks, Boston, Massachusetts.

No. 25. Cod and Cusk skins made into leather.

No. 26. Pair of shoes (Newport ties) made from Cusk skins.

No. 27. Samples of George's Hake sounds from which fibrous isinglass is made. They will make liquid isinglass, but it would come very expensive. This quality of sounds are worth 75 cents per pound dry.

No. 28. Sample of Cod sounds that are used for fibrous isinglass. Liquid isinglass can be made from them. This quality of sounds are worth 17 cents per pound, dry.

No. 29. Sample of fish glue made from fresh fish heads; is not as strong as glue made from the skins.

No. 30. Sample of our liquid glue in bottles, from fish skins, for household use.

No. 31. Sample of our goods put up in boxes for the trade.

No. 32. Sample of our mechanics' liquid glue for all kinds of wood work, boots and shoes, paper boxes, &c., in cans.

No. 33. Guano manufactured by this company from salt fish and bones, waste that has been removed from the fish, in preparing boneless fish for the market. Last year there were 3,000 tons of this waste; it had a market value of $12 per ton. According to an analysis by S. P. Sharples, United States assayer, this guano contains:

	Per cent.
Phosphoric acid	9.67
Equal to bone phosphate	21.10
Nitrogen	8.45
Equal to ammonia	10.26
Moisture	5.30

No. 34. Guano from the fish skins, Cod and Cusk, after the glue has been removed. According to an analysis by S. P. Sharples, United States assayer, this guano contains:

	Per cent.
Phosphoric acid	9.38
Equal to bone phosphate	20.47
Nitrogen	8.12
Equal to ammonia	9.86
Moisture	5.23

No. 35. Guano from Pollock skins and scales, after the glue has been removed. According to an analysis by S. P. Sharples, United assayer, this guano contains:

	Per cent.
Phosphoric acid	15.82
Equal to bone phosphate	34.53
Nitrogen	8.65
Equal to ammonia	10.50
Moisture	6.29

GLOUCESTER ISINGLASS & GLUE COMPANY, Gloucester, Massachusetts:

Exhibit of Liquid Isinglass, etc.—Continued.

No. 36. Guano from Halibut heads, after the oil has been removed. According to an analysis by S. P. Sharples, United States assayer, this guano contains:

	Per cent.
Phosphoric acid	12.89
Equal to bone phosphate	27.14
Nitrogen	5.29
Equal to ammonia	6.42
Moisture	5.11

No. 37. Guano from fresh fish heads after the glue has been removed. According to an analysis by S. P. Sharples, United States assayer, this guano contains:

	Per cent.
Phosphoric acid	20.22
Equal to bone phosphate	44.14
Nitrogen	6.52
Equal to ammonia	7.91
Moisture	3.48

No. 38. Fishes eye-balls after the heads have been boiled.

No. 39. Sample of frozen fish glue.

"The utilizing of fish waste or skins was first discovered by the patentee, John S. Rogers, of Gloucester, Massachusetts, U. S. A., in the fall of 1873. Having tried a number of loads for fertilizing purposes, he found that it was very hard material to make into a fertilizer, as it was very highly salted, and the skins would not work up nor the bones dissolve. The Gloucester Isinglass and Glue Company have a process for making all the bone and skin into guano, that has a market value of $30 per ton. Having noticed a gummy or sticky substance in handling what skins he tried for fertilizing purposes, Mr. Rogers was led to think that isinglass or glue could be made from them, and offered some of the fish merchants five cents per barrel to keep the skins by themselves. From these skins he experimented and finally made samples of glue from fish skins, such as are shown at this exhibition, only on a very small scale. At this time parties in the boneless fish business did not know what to do with their fish waste and skins taken from the fish in preparing their goods for market, and would pay from 25 to 50 cents per ton to have them removed from their buildings. Now they very often see what they can get for their skins before they make a price for the fish in filling orders. The preceding descriptive account of the different articles exhibited by the Gloucester Isinglass and Glue Company shows the results obtained by the process, starting from the raw material."—(*John S. Rogers.*)

MONROE A. GREEN, Mumford, Monroe County, New York:

Samples of barbless hooks, made by Mr. Green for Trout and Bass fishing. (18.)

Box for the transportation of fish ova. (35.)

SETH GREEN, Rochester, New York:

Hybrid between California Salmon and Brook Trout; hybrid between Salmon Trout and Brook Trout. (36.)

Floating box for use in open stream. (35.)

OSCAR HARGER, Peabody Museum, Yale College, New Haven, Connecticut:

Publications upon Isopod Crustaceans. (60.)

HAVEN, WILLIAMS & CO., New London, Connecticut:

Whale oils. (29.)

WILLIAM P. HAYWOOD, West Creek, Ocean County, New Jersey:

Model of Oyster Tongs. (2.)

J. E. HENDLEY, United States National Museum, Washington, District of Columbia:

Plaster cast of negro fisherman. (21.) (The lay figures in the collective exhibit of the United States, with the exception of the whalemen, were made by Mr. Hendley.)

HIGGINS & GIFFORD, Gloucester, Massachusetts:

Higgins & Gifford's life-saving surf-boat (full size and model). (9.)
Model of fish wharf. (7.)

J. E. HILGARD, Superintendent United States Coast and Geodetic Survey:

Ocean salinometer and optical densimeter. (40.)

L. S. HILL & CO., Grand Rapids, Michigan:

Frame containing samples of Hill's Spoon Baits. (14–16.)
Frame containing an illustrated card of Hill's Baits with commendations, &c. (14–16.)

HINE & CO., 13 and 15 Doyers street, New York City:

Cooked preparations in cans. (26.)
Terrapin Soup, in cans.
Green Turtle Soup, in cans.
Terrapin stew, in cans.

WAKEMAN HOLBERTON, 65 Fulton street, New York City:

Full-length Holberton Fly Books.

No. $\frac{2}{0}$. Finest Alligator-skin cover, capacity 6 dozen Trout Flies. (15.)
No. $\frac{0}{1}$. Russia cover, capacity 3 dozen Salmon or Bass Flies. (14.)
No. 1. Russia cover, capacity 1 gross Trout Flies. (15.)
No. 2. Russia cover, capacity 8 dozen Trout Flies. (15.)
No. 3. Leather cover, capacity 6 dozen Trout Flies. (15.)
No. 4. Leather cover, capacity 3 dozen Trout Flies. (15.)
No. 5. Muslin cover, capacity 3 dozen Trout Flies. (15.)

"ADVANTAGES CLAIMED FOR THESE BOOKS.—Flies are kept separate, straight, and at full length, so that the angler, when fishing, can attach them at once to the leader. No woolen leaves to attract moths. The finer qualities have a heavy blotting-paper leaf for drying the flies, and all have pockets between each leaf. These

WAKEMAN HOLBERTON, 65 Fulton street, New York City:

Full-length Holberton Fly Books—Continued.

books have a greater capacity and are much less bulky than the old ones. The clips are of spring brass and silver plated, and will not tear out or come loose with ordinary use. These books were invented by W. Holberton, and are now universally used, and have been copied by all dealers."—(*Holberton.*)

FRANK HOLMES, Chagrin Falls, Ohio:

Stranahan folding canvas boat, length 10 feet. (20.)

"These boats are a combination of lightness, strength, and durability, such woods being selected as give these qualities in the highest degree, and all made upon honor from first to last. The water-proof gum which we use renders the duck water-tight and water-proof, and at the same time preserves the strength of the fiber and protects the cloth from mildew and mold, being of uniform pliability in both intense hot and cold weather. The canvas is heavier and stronger than that used by other firms, the best quality always being used. Each boat has an adjustable stretcher attached to the stern, which provides for stretching the cloth as taut as a drum-head. The real capacity of the boats is greater than given in the table, but they will carry the weights given with perfect ease. We keep a stock of each size constantly on hand, and will make special sizes at reasonable rates. The ten-foot boat has eleven ribs; the twelve-foot, fifteen; the fifteen foot, nineteen. This brings the ribs so close together that (combined with the bilge or stiffening slats which are placed at equal distances between the gunwales and bottom) all bagging of the cover is obviated. The bow and stern pieces, gunwales, bilge slats, and ribs are made of second-growth red elm, the bottom strips, stools, oars, and paddles are of second-growth linden (basswood). The gunwales are $1\frac{7}{8}$ inches wide by $\frac{1}{4}$ inch thick, the ribs and side slats $1\frac{1}{8} \times \frac{1}{4}$ inches; bottom slats $1 \times \frac{5}{8}$ inch. The frame has three strips the size of the ribs, running lengthwise of the bottom, outside of the ribs, being fastened together with wrought nails firmly clinched. The frame is cut in the center at the two ribs nearest together, as shown in the cut, the pieces cut alternating on each rib, and fastening at each gunwale and at two points on the bottom, with wrought-iron latches fastened with thumb-screws. We also make them in three sections, at an additional cost of $3. The canvas is secured to the frame by leather straps buttoned to the inside of the gunwales over round-headed screws. The frames are neatly painted and trimmed, each strip primed before they are put together, making every part impervious to th1 water. The oars and paddles are copper-tipped and finished with varnish. In shipping, the canvas is entirely removed, folded compactly, and secured to the inside of the frame with the stools and oars, making one complete package, so that nothing can be misplaced or lost, and no danger or damage to canvas. We claim the following advantages for our boat: It is the lightest complete boat made of its size, length and breadth considered. The duck is made in one piece, and, therefore, the only seams below water-line are those at the ends, which are as strong as any other part of the cloth. It will stand as heavy a sea as any wooden boat of the same size. They are pointed at

FRANK HOLMES, Chagrin Falls, Ohio:

Stranham folding canvas boat—Continued.

both ends, and straight and flat on the bottom. There are two sets of row-locks in each boat, one to use when one or three persons are using it, the other when there are two, thus maintaining a "trim" position in the water. The construction of the boat is such that the cloth is kept out to its place and a good shape maintained, which cannot be done with the majority of canvas boats. They being flat on the bottom makes them very steady for shooting or casting while standing, a very desirable point, as every practical sportsman knows. They also make a desirable family pleasure boat, and a sail can be attached if desired. The boat can be folded and made ready for transportation in a few minutes, and unfolded and put together, ready for use, in the same length of time, no tools being required. Any of the modern rowing gears can be applied and used. Prices given in the table are for boats with oars and stools. We can give no discount on these prices, as we are selling very low and do not sell through agents, preferring to give the purchaser the benefit of the agent's usual commission. We will make a reduction of $2 for a paddle in place of a pair of oars. Paddles furnished with boats if desired at 75 cents apiece extra. We also furnish shoulder straps for carrying the boat when desired. By means of these straps one man can carry the boat, when folded, almost any distance with perfect ease, both hands being free. Price of straps and fixtures $1 extra. These boats when folded occupy one-half their size in length, being in two sections, the full width being maintained. The three sections when folded occupy one-third their size in length, the full width being maintained. We manufacture three sizes, of the following dimensions and weights, with oars and stools:

10-foot boat, price $20; width at bottom, 18 inches; capacity, 400 pounds; width at top, 32 inches; oars, one pair; depth at center, 11 inches; number stools, two; depth at ends, 15 inches; 6-foot oars; weight, 35 pounds.

12-foot boat, price $25; width at bottom, 26 inches; capacity, 600 pounds; width at top, 38 inches; oars, one pair; depth at center, 13 inches; number stools, three; depth at ends, 17 inches; 6½-foot oars; weight, 50 pounds.

15-foot boat, price $35; width at bottom, 28 inches; capacity, 800 pounds; width at top, 40 inches; oars, two pairs; depth at center, 14 inches; number stools, four; depth at ends, 18 inches; 6½-foot oars; weight, 65 pounds.

For boat in three sections add $3 to price."—(*Holmes.*)

MARSHALL H. HOLMES, 226 N. Fourth street, Philadelphia, Pennsylvania:

Holmes's Life-Preserving Mattress and Berth. (9.)

"A Life Preserving Mattress inclosed in a berth, which is movable, and answers the four functions of a bed, boat, life-preserver, and, when a number of them are lashed together, they make a very formidable raft. Each berth is supplied with an extra cord or line, to be thrown to any one in distress, or to lash the berths together when forming a raft, and each berth has a pair of oars for the purpose of propelling the same. In case of an accident the

MARSHALL H. HOLMES, 226 N. Fourth street, Philadelphia, Pennsylvania:

Holmes' Life-Preserving Mattress and Berth—Continued.

berth is drawn out with its contents and dropped or lowered overboard. The buoyancy is very great. The mattress, containing solid cork and cork shavings, will support the largest person in the water. There is also a central hole in the center of the mattress, through which the occupant can go and seat himself or herself on a saddle underneath, which throws all the upper part of the body out of the water and gives the person the free use of the oars, which are chained fast to the berth. The whole device weighs from 32 to 35 pounds; is the full size of a berth, and it slides on cleats in the stateroom the same as a drawer. This invention has been adopted as a life-preserver by the United States Board of Supervising Inspectors of Steamboats, and resolutions been adopted by the Boards of Trade and Chambers of Commerce and Maritime Exchanges of the principal cities of the United States, among which are New York, Boston, Philadelphia, Chicago, Saint Paul, Cincinnati, Saint Louis, and Detroit, and has the hearty endorsement of practical vessel-owners in all of these cities. The present address of the inventor, M. H. Holmes, is 226 N. Fourth street, Philadelphia, Pennsylvania, United States.—(*Holmes.*)

WILLIAM J. HOOPER SONS (Baltimore Twine and Net Company), Baltimore, Maryland:

Exhibit of netting. (8.)

W. T. HORNADAY, United States National Museum, Washington, District of Columbia:

Specimens of Taxidermy. (53.)
Walrus Head.
Quinnat Salmon (in collective exhibit).

WILLIAM HUME, Astoria, Oregon:

Cooked preparation in cans. (26.)
Canned Salmon.

ICHTHYOPHAGOUS CLUB, New York City:

Collection of *menus* of annual dinners of the club. (57.)

THOMAS A. IRVING, Provincetown, Massachusetts:

Full-rigged model of three-masted cod-fishing schooner "Lizzie W. Matheson," of Provincetown, Massachusetts. (4.)

PROF. DAVID S. JORDAN, Indiana University, Bloomington, Indiana:

Works on Ichthyology. (60.)

DANIEL KELLEHER, New Bedford, Massachusetts:

An explosive hand-lance for killing whales. (1.)

GEORGE KNOWLES, Provincetown, Massachusetts:

Ear-bone of finback whale. (54.)
Banjo made by a negro whaleman. (21.)

JOHN P. KNOWLES, 2d, New Bedford, Massachusetts:

Lower cutting-block showing the improved method of strapping with iron bands. (6.).

THOMAS KNOWLES & CO., New Bedford, Massachusetts:

Series of articles used in the whale-fishery. (1.)

LAWRENCE & CO., New London, Connecticut:

Implements used by whalemen and sealers. (1.)

WILLIAM LEWIS, New Bedford, Massachusetts:

One whaling-gun and apparatus used in the whale-fishery. (1.)

W. K. LEWIS & BROTHERS, Boston, Massachusetts:

Cooked preparations in cans. (26.)

Canned fresh Lobsters, 1-pound and 2-pound cans.
Canned fresh Clams, 1-pound and 2-pound cans.
Canned fresh Mackerel, 1-pound and 2-pound cans.
Canned fish Chowder, 3-pound cans.
Canned clam Chowder, 3-pound cans.

Fishermen's food. (22.)

Canned roast Mutton, 2-pound cans.
Canned roast Beef, 2-pound cans.
Canned roast Turkey, 2-pound cans.
Canned roast Chicken, 2-pound cans.

W. N. LOCKINGTON, Philadelphia, Pennsylvania:

Publications on marine fishes and invertebrates. (60.)

LOOMIS, PLUMB & CO., Syracuse, New York:

Bronze Plate Automatic Reel, for 90 feet of line, No. 1. (14–16.)
Nickel Plate Automatic Reel, for 150 feet of line, No. 2. (14–16.)

H. & G. W. LORD, Boston, Massachusetts:

Exhibit of cotton netting used in the manufacture of seines, traps, dip-nets, &c. (8.)

DAVID W. LOW, Gloucester, Massachusetts:

Low's Improved Ice-Crusher. (34.)

F. A. LUCAS, United States National Museum, Washington, District of Columbia:

Exhibit of stuffed Turtles, &c. (52.)
Exhibit of stuffed Crabs and Lobsters.* (51.)

---

* The stuffed Lobsters shown in the National Museum Exhibit were prepared by Mr. Lucas.

JOHN McCULLOUGH, New Bedford, Massachusetts:

Articles used in the whale-fishery. (1.)

MARSHALL McDONALD, Washington, District of Columbia:

Various kinds of apparatus used in hatching adhesive, floating, and heavy eggs; also apparatus for the transportation of eggs and young fish. (35.)

Series of eggs and fry showing development and growth as follows:

Brook Trout, Lake Trout, and White-fish. (36.)

Model of counter-current fish-way, the partitions being so arranged that the velocity of the current is retarded by the water being turned against itself. (37.)

Publications upon fish culture.

H. D. McGOVERN, Brooklyn, New York:

Stuffed trout, and *Belostoma* which killed it. (49.)

McKESSON & ROBBINS, 91 Fulton Street, New York City:

Collection of Florida Sponges. (43.)

Collection of cultivated Sponges. (36.)

MACKEY & P.NDAR, New Bedford, Massachusetts:

Apparatus used in the whale-fishery. (1.)

McMENAMIN & CO., Hampton, Virginia:

Cooked preparations in cans. (26.)

Fresh Deviled Crabs, No. 2. Cans.

Fresh Deviled Crabs, No. 1. Cans.

This is the meat of the crab carefully picked, seasoned, and packed in cans, as above. The carapace or top shell of the crab accompanies each case of cans—a case of shells to each case of cans. These are filled from the cans, baked in a quick oven until nicely browned, and eaten from the shell; or the shells may be dispensed with, and the meat may be eaten from the can, or prepared into a variety of dishes.

Fresh Crab Meat, No. 2. Cans.

Fresh Crab Meat, No. 1. Cans.

Extra selected Oysters, Lion brand, No. 2. Cans.

Extra selected Oysters, Lion brand, No. 1. Cans.

Extra cove Oysters, Hampton Roads brand.

Cove Oysters, Hampton Roads brand, No. 2. Cans.

Cove Oysters, Hampton Roads brand, No. 1. Cans.

Lunch Oysters, in flat cans.

"We are the pioneers in the packing of canned crabs. So far as we are able to learn, the idea was first conceived and put into execution by ourselves. Other similar establishments started afterwards, but to-day we are the only packers of canned crabs in America." (*McMenamin & Co.*)

JOSEPH B. MACY, Nantucket, Massachusetts:

Sundry articles used in the whale-fishery, including harpoons used to kill the whale with prussic acid. (1.)

H. J. MAHRENHOLZ, New York City:

Boots and shoes made of alligator leather. (32.)

JOHN MANN & CO., Syracuse, New York:

Artificial trolling spoons. (14–16.)

MANN BROS., Chicago, Illinois:

Packages for transporting oysters. (33.)

C. B. MARCHANT, Edgartown, Massachusetts:

Series of lances cut from dead whales. (1.)

HENRY MARSHALL, United States National Museum, Washington, District of Columbia.

Mounted group of aquatic birds. (53.)

H. W. MASON, New Bedford, Massachusetts:

Explosive and non-explosive projectiles for killing whales. (1.)

MASSACHUSETTS HUMANE SOCIETY:

Reports of the Massachusetts Humane Society. (9.)

Medals for Life-Saving Service granted by the Massachusetts Humane Society. (9.)

FRED. MATHER, New York City:

Conical apparatus used in hatching eggs of the shad; also boxes and cans for the transportation of fish and fish ova. (35.)

Collection of fishes from the Adirondack region, with map showing distribution of species, and report. (51, 55.)

HENRY MAYO & CO., Boston, Massachusetts:

Pickle or brine salted preparations. (26.)

Paragon Mess Mackerel, 5-pound cans.
Perfection Mess Mackerel, 5-pound cans.
Standard Mess Mackerel, 5-pound cans.
Breakfast Mess Mackerel, 5-pound cans.
Family Mess Mackerel, 5-pound cans.

Preparations in spices, vinegar, &c. (26.)

Soused Mackerel, 1-pound, 2-pound, 3-pound, and 4-pound cans.

Cooked preparations in cans. (26.)

Fresh Mackerel, 1-pound and 2-pound cans.
Fresh Mackerel in tomato sauce, 3-pound cans.
Fresh Mackerel in tomato sauce, 2-pound square cans.
Fresh Mackerel in mustard, 3-pound cans.

HENRY MAYO & CO., Boston, Massachusetts:

Pickle or brine salted preparations—Continued.

Fresh Mackerel in mustard, 2-pound square cans.
Fresh Salmon, 1-pound cans.
Fresh Lobsters, 1-pound cans.
Clam Chowder, 3-pound cans.
Fish Chowder, 3-pound cans.
Green Turtle soup.
Fresh Clams, 1-pound and 2-pound cans.
Codfish balls, 2-pound cans.

Fishermen's food in cans. (22.)

Baked Beans, Bean-pot brand.
Picnic Beans, Bean-pot brand.
Green Lima Beans, Bean-pot brand.
Green Lawnsdale Beans, Bean-pot brand.
Green Corn.
Green Peas.
Fresh Pumpkin.
Fresh Squash.
Fresh Tomato.
Fresh Succotash.
Roast Beef.
Roast Lamb.
Roast Turkey.
Roast Chicken.
Beef Soup.
Chicken Soup.
Macaroni Soup.
Mock turtle Soup.
Mutton Soup.
Ox-tail Soup.
Pea Soup.
Tomato Soup.

GEORGE MERCHANT, Jr., Gloucester, Massachusetts:

Model of Mackerel pocket. (1.)
Fishermen's games and puzzles. (21.)

B. C. MILAM, Frankfort, Kentucky:

Milam or Frankfort Fishing Reel. (14–16.)

"A combined multiplying and click reel used for either bait or fly fishing, and multiplies four times. The friction of the parts is so slight that a smart stroke of the handle causes it to make about fifty revolutions. For bait fishing the reel is used clear, with alarm and rubber both off, and, with a little practice, one can drop his bait at any desired spot within 50 or 60 yards with ease. For fly fishing the rubber or drag is put on, and if you desire a click also

B. C. MILAM, Frankfort, Kentucky:

Milam or Frankfort Fishing Reel—Continued.

the alarm or click is used. These improvements can be used separate or together as desired. We wish to call special attention to these important adjuncts, and have their use fully understood, for with their aid you can make a multiplying or click reel at pleasure, thus rendering the "Frankfort" doubly valuable. They are operated by sliding disks on side of reel, and do not in the least complicate its working. Made in brass and German silver in six sizes, costing from $13 to $26 each."—(*Milam.*)

THE GEORGE W. MILES COMPANY, Milford, Connecticut:

Samples of Menhaden; Menhaden oil and guano. (29.)

One Jar.—Containing 3 Menhaden.

Two Jars.—Containing Pure Menhaden Oil.

Jar No. 1.—George W. Miles' I. X. L. Ammoniated Bone Superphosphate, containing ammonia 3 to 5 per cent.; available phos. acid, 10 to 12 per cent.; potash, 2 to 4 per cent. ammonia, produced from fish.

Jar No. 2.—Miles' Patented Ammoniated Superphosphate, containing ammonia, 2½ to 3½ per cent.; available phos. acid, 8 to 10 per cent.; potash, 1 to 3 per cent. ammonia, produced from fish.

Jar No. 3.—George W. Miles' Patented Acid Fish No. 1, containing ammonia, 10 to 12 per cent.; available phos. acid, 4 to 6 per cent. This is fish fresh from the presses treated with acid.

Jar No. 4.—Miles' Patented Acid Fish No. 2, containing ammonia, 9 to 11 per cent.; available phos. acid, 4 to 6 per cent. This is fish after passing through a sweating process treated with acid.

Jar No. 5.—George W. Miles' Patented C. Island Guano, No. 1, containing ammonia, 10 to 12 per cent.; bone phosphate of lime, 14 to 17 per cent. This is fish fresh from the presses dried in steam dryers.

Jar No. 6.—Miles' C. Island Guano, No. 2, ammonia, 8 to 10 per cent.; bone phosphate of lime, 10 to 12 per cent. This is fish dried in steam dryers after passing through a sweating process.

Jar No. 7.—Pure Dried Fish, No. 1, containing ammonia, 10 to 12 per cent.; bone phosphate of lime, 9 per cent. This is fish fresh from the presses dried on platforms and ground.

Jar No. 8.—Pure Dried Fish, No. 2, containing ammonia, 10 to 12 per cent.; bone phosphate of lime, 9 per cent. This is fish fresh from the presses dried on platforms, unground.

Jar No. 9.—Miles' Ammoniated Dissolved Bone; ammonia, 2 to 3 per cent.; 7 to 9 per cent. phos. acid; ammonia, from fish.

Jar No. 10.—Miles' Dissolved Black, containing 36 per cent. bone phos. of lime; burnt bone dissolved in acid.

Jar No. 11.—Miles' Acid Phosphate, containing 25 per cent. bone phos. of lime.

Jar No. 12.—George W. Miles' Ammoniated Acid Phosphate, containing 3 per cent. of ammonia; 22 per cent. bone phos. of lime; ammonia produced from fish.

Jar No. 13.—Pure Rock Phosphate, 60 per cent. bone phos. of lime.

Jar No. 16.—Miles' Fish and Potash, No. 1; ammonia, 4 to 6 per cent.; available phos. acid, 5 to 8 per cent.; potash, 4 to 6 per cent.

Jar No. 17.—Miles' Fish and Potash, No. 2; ammonia, 3 to 5 per cent.; available phos. acid, 5 to 8 per cent.; potash, 4 to 6 per cent.

THE MILLER BERTH AND LIFE-SAVING MATTRESS COMPANY,

Boston, Massachusetts. Capt. Benj. F. Flinn, Agent:

Life-Saving Mattress. (9.) (Patented December, 1880.)

"A life-preserving arrangement, which consists of an ordinary mattress, surrounded upon all its sides with a flexible rubber tube, divided into compartments, filled with compressed air and cork. Although the weight of the mattress is only fifteen to twenty pounds, it has a buoyancy upon the water capable of sustaining six or seven hundred pounds, and in case of shipwreck or disaster the passenger can, instead of being obliged to hunt around for a life-preserver, take up his bed and walk, with the confidence that he has a better means of saving his life than from any device hitherto invented for enabling shipwrecked persons to reach the land in safety. In case of the shipwreck of a large vessel, a number of these mattresses can be combined into rafts of any desirable size, by using the "lashings" with which they are provided, so as to make them capable of landing one hundred or more passengers at a time through breakers and over the roughest seas in the most tempestuous weather."—*Captain Flinn.*

WILLIAM MILLS & SON, 7 Warren street, New York City:

Salmon rod: Leonard's Split Bamboo, 16 feet, 32 ounces. (14.)
Salmon rod: Leonard's Split Bamboo, 15½ feet, 26 ounces. (14.)
Bass bait rod: Leonard's Split Bamboo, 10¾ feet, 15¾ ounces. (16.)
Bass bait rod: Leonard's Split Bamboo, 8¼ feet, 9¾ ounces. (16.)
Trout fly rod: Leonard's Split Bamboo, 11½ feet, 8¾ ounces. (15.)
Trout fly rod: Leonard's Split Bamboo, 10½ feet, 8½ ounces. (15.)
Catskill rod: Leonard's Split Bamboo, 10 feet, 4⅞ ounces. (14–16.)
Trunk fly rod: Leonard's Split Bamboo, 11 feet, 10¼ ounces. (14–16.)
Combination rod: Leonard's Split Bamboo. (14–16.)
Salmon reels: Leonard's patent. (14.)
Trout reels: Leonard's patent. (15.)
Salmon reels. (William Mills & Son's new patent.) (14.)
Trout reels. (William Mills & Son's new patent.) (15.)
Multiplying reels: (B. H.) adjustable click, three sizes, 2, 3, and 4, in rubber and German silver. (14–16.)
Braided linen lines. (B, C, D, E, F, G.)
Salmon lines: standard tapered silk (B and C), 120 yards each. (14.)
Fly lines: standard level silk (E, F, and G), 100 yards each. (14–16.)
Braid-silk lines: standard (C, D, E, F, G, and H), 50 yards each. (14–16.)
Fly lines: standard tapered silk (F), each 30 and 50 yards. (14–16.)
Fly lines: standard tapered (E), each 25 and 40 yards. (14–16.)
Leaders: single, double, and twisted, Nos. 1 to 8; lengths, 3 feet, 6 feet, and 9 feet. (14–16.)
Flexible Minnows: Nos. 2, 3, 4, 5, 6, 7, 8. (14–16.)
Caledonian Minnows: Nos. 3, 4, 5, 6, 7, 8, 9, 10. (14–16.)
Phantom Minnows: Nos. 5, 6, 7, 8. (14–16.)

WILLIAM MILLS & SON, 7 Warren street, New York City:

Protean Minnows: Nos. 4, 5, 6. (14–16.)
Artificial Dobson: large and small. (14–16.)
Artificial Frogs: large and small. (14–16.)
Artificial Crawfish, Grasshopper, Cricket, and May-fly. (14–16.)
Lone Star Baits. (14–16.)
Eclipse Baits. (14–16.)
Bates' Patent Spinner. (14–16.)
Minnow Gangs: five styles. (14–16.)
Leonard Click Reel. (14–16.)
Billinghurst Reel. (14–16.)
Bass and Trout Hooks.
Virginia Hooks.
Blackfish Hooks.
Tapered-point Blackfish Hooks.
Aberdeen Hooks.
Sneck Hooks.
Sproat Hooks.
Chestertown Hooks.
Central Draught Hooks.
Bright Treble Hooks.
Spring Shank Treble Hooks.

WILLIAM MITCHELL, 26 Vandam street, New York City:

Salmon rods; five varieties. (14.)
Trout rods; twelve varieties. (15.)
Bass rods; five varieties. (16.)
Salmon reel; one sample. (14.)
Trout reel; one sample. (15.)
Bass reels; two samples. (16.)

TROUT FLY RODS.

	Length.	Weight.	Reel and line.	Leverage.
	Feet.	*Ounces.*	*Ounces.*	*Ounces.*
No. 1	12	9½	6½	30
No. 2	11½	7½	5	26
No. 3	11	6½	4¾	22
No. 4	10	4½	3½	16
No. 5	9½	4	3½	13

SALMON RODS.

Length.	Weight.	Reel and line.	Leverage.
	Ounces.	*Ounces.*	*Ounces.*
14 feet	17	19½	20
16 feet	26	22	47
16½ feet	28	22	50
17 feet	30	22	64
18 feet	35	22	74

WILLIAM MITCHELL, 26 Vandam street, New York City:

Split bamboo rods of the same class average from 1 *to* 3 *ounces heavier.* [*See "Henshall's Book of the Black Bass," or "Forest and Stream," January* 2, 1879.]

"The average leverage, holding the rods at an angle of 30° from the horizontal, is fairly two-thirds of the foregoing. Rod No. 1 is a standard black bass rod. Upon a No. 2 was caught and killed, without gaff or net, a salmon which weighed 33 pounds. No. 3 is the "standard" trout rod at present in this part of the country. A "standard" rod of 1843, made for Daniel Webster (sent in for repair), has also been tested: Length, 12 feet; weight, 17½ ounces; weight of reel and line, 7 ounces; leverage, 5 pounds. As the reel is above the hand, this rod of 1843 is not so strong, nor will it stand work, nor can it cast as far as the 11-feet standard of to-day. A 10 ounce rod is now almost as obsolete as that one of 1843.

A fly rod of 11 feet in length, weighing 6½ ounces, having on it a No. 4 reel and line weighing 4¾ ounces (grip above reel, of course), the leverage is 22 ounces, that is, if the rod be held level; upright, of course, there is no leverage; if the rod were held most of the time at an angle of 45°, the average power exerted would be 11 ounces; but the rod is held lower, nearer 30°, and it is safe to say that, on such a light rod, a power of over more than one pound and a half is constantly straining on the muscles.

The principles of a good fly rod have been reduced to axioms by William Mitchell, of New York, who is the father of the American fly-rod manufacture. His axioms are:

1. The less number of pieces in which a rod is made, the more perfect will be its action, and the less its liability to get out of order.

2. The more homogeneous the materials of which the rod is made, if it have sufficient elasticity and strength, the longer will it stand the necessary strain without injury.

3. The more impervious to the action of water, dampness, or change of atmosphere, the longer will the rod retain its elasticity and perfect action.

4. All weight in wood or metal in a rod, above the grip, which does not strengthen the rod, weakens it, and, with all weight added below the grip, to balance the rod, is so much useless weight.

5. When, in any given rod, under the necessary strain, any part does not bend, that part does not bear its proportion of the strain, and the latter is transferred to the next adjacent weaker part (which is the spot where the rod will break, if at all); so that an absolutely perfect rod should be springy from tip to heel-plate of butt.

6. The rod possessing sufficient elasticity and strength, with lightness, and which is the least liable to get out of order from any cause, and which, when broken, is the easiest to repair (right on the stream), is the nearest to perfection that a rod can be made.

The "MITCHELL FLY ROD," with *patent* handpiece, is the only fly rod having perfect spring from tip to heel-plate, and is the lightest and strongest fly rod made.

The original and only maker of the celebrated McGinnis black bass rod."

MUSEUM OF COMPARATIVE ZOOLOGY, Cambridge, Massachusetts:

Publications upon ichthyology and marine invertebrates. (60.)

CHRESTEN NELSEN, Gloucester, Massachusetts:

Patent preservative for canvas, manila rope, and netting. (5.)

Specimens of canvas, rope, and netting, preserved with the fluid. (5.)

NEW BEDFORD CORDAGE COMPANY, J. W. Macomber, agent, New Bedford, Massachusetts:

Samples of whale-line and lance-warp used in the capture of the whale (1); and of guy-rope and cutting falls used in cutting in the whale. (1.)

NICKERSON & BAXTER, Boston, Massachusetts. Agents for J. W. Court & Co.:

Samples of fish-hooks used in sea fisheries, manufactured by J. W. Court & Co., Brooklyn, New York. (1.)

These hooks are mostly used in the Cod, Haddock, Hake, Halibut, and Mackerel fisheries, though the latter fishing is now conducted almost entirely with the purse seine. The central draught hooks are the latest pattern, and are usually given the preference over the straight shank hook. No. 10 central draught and No. 6281 straight shank are used for large Codfish in hand-line fishing, and Nos. 11, 12, and 13, and 6282–3–4 for smaller fish. No. 14 is a Grand Bank trawl hook, and 15, 16, and 17 are for Haddock trawls.

B. F. NICHOLS, Boston, Massachusetts:

Hexagonal split bamboo fishing rods. (14–16.)

FLY RODS.

No. 1. 10 feet long, 3 pieces, weight 7 ounces, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 2. 11 feet long, 3 pieces, weight 8 ounces, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 3. 11½ feet long, 3 pieces, weight 9 ounces, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 4. 11½ feet long, 3 pieces, weight 10 ounces, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 5. 12 feet long, 3 pieces, weight 10½ ounces, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 6. 12 feet long, 3 pieces, weight 12½ ounces, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 7. GENERAL ROD. 11½ feet long, with Fly Tip, weight 10½ ounces; and 9½ feet long, weight 9½ ounces, with short tip (2 feet long), for Bait Fishing or Trolling.

This is a very handy rod, is suitable for Bass or Trout, with the fly tips (of which there are two), and Bait Fishing or Trolling, with the short tip; making the rod in 3 pieces, Bamboo tip case, sack and wood shipping case.

BLACK BASS RODS.

No. 8. 10 feet long, 3 pieces, weight 9½ ounces, ring guides, reel-seat below grasp, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 9. 10 feet long, 3 pieces, weight 10 ounces, standing guides, reel-seat above grasp, 2 tips, Bamboo tip case, sack and wood shipping case.

No. 10. 8½ feet long, 2 pieces, weight 9½ ounces, standing guides, reel-seat above grasp, 2 tips, grooved wood case, sack and wood shipping case.

B. F. NICHOLS, Boston, Massachusetts:

Hexagonal split bamboo fishing rods—Continued.

STRIPED BASS RODS.

1 rod, 8 feet long, 2 pieces, weight 19 ounces.
1 rod, 8½ feet long, 2 pieces, weight 20 ounces.
1 rod, 9 feet long, 2 pieces, weight 25 ounces.
1 rod, 8 feet long, 3 pieces, weight 20 ounces.
1 rod, 8½ feet long, 3 pieces, weight 22 ounces.
1 rod, 9 feet long, 3 pieces, weight 25 ounces.

SALMON RODS.

1 rod 16 feet long, 3 pieces, weight 26 ounces.
1 rod 16½ feet long, 3 pieces, weight 27 ounces.
1 rod 17 feet long, 3 pieces, weight 28 ounces.
1 rod 17½ feet long, 3 pieces, weight 30 ounces.
1 rod 18 feet long, 3 pieces, weight 32 ounces.

GRILSE RODS.

1 rod 14 feet long, weight 22 ounces.
1 rod 14½ feet long, weight 23 ounces.
1 rod 15 feet long, weight 24 ounces.
All rods have full German silver reel-plate and mountings, and grooved cases covered with cloth and cloth sacks. All above rods have two duplicate tips.

CALEDONIA FLY RODS.

No. 1. 9 feet 4 inches long, weight 5¼ ounces, 3 pieces, 2 tips.
No. 2. 9 feet 8 inches long, weight 6 ounces, 3 pieces, 2 tips.
Full German silver mountings, grooved cases, etc.

THE TOURIST COMBINATION ROD.

12 feet long, in 4 pieces, weight 13 ounces, with extra butt-joint, and extra reversible grasp and reel-seat (to be used with reel above or below the hand), and extra short tip for trolling or bait fishing, and extra long butt-joint, to be used instead of first and second joint, making a 9 feet 7 ounce fly-rod, making in all 8 pieces, and four regular and perfect rods, all in a cloth-covered grooved case 3 feet 3 inches long, all weighing about 4 pounds when packed. It has full German silver mountings.

JOHN W. NORTON, Edgartown, Massachusetts:

Log-book. (6.)

OLD COLONY MILLS, Plymouth, Massachusetts:

Samples of Canvas used on fishing-vessels. (5.)

OREGON PACKING COMPANY, J. W. and V. Cook, Proprietors, Portland, Oregon:

Cooked Preparations in cans. (26.)
Canned Salmon. (One-half dozen cans.)

JAMES C. OSBORNE, Edgartown, Massachusetts:

Whaling harpoon. (1.)

SAMUEL OSBORNE, Jr., & SONS, Edgartown, Massachusetts

Implements used in the whale-fishery.

N. A. OSGOOD, Battle Creek, Michigan:

Portable Folding Canvas Boat. (20.)

Length, 12 feet; width, 3 feet; height, 1 foot.

Folding Minnow Crate. (33.)

H. D. OSTERMOOR & SON, 36 Broadway, New York City:

Life-saving Mattress. (9.)

A. S. PACKARD, Jr., Providence, Rhode Island:

Publications on aquatic invertebrates. (60.)

THOMAS B. PADDOCK, Nantucket, Massachusetts:

An implement used on Nantucket whaling vessels in 1775. (1.)

E. W. PAGE, & CO., 69 West street, New York City:

Exhibit of oars used on fishing and whaling vessels. (6.)

JOSEPH PALMER, United States National Museum, Washington, District of Columbia:

Casts of seal and fish (51–54) (the entire collection of casts of cetaceans, reptiles, and fishes in the collective exhibit of the United States was made by Mr. Palmer).

JOEL C. PARKER, Grand Rapids, Michigan:

Hatching box with clock-work attachment for supplying motion. (35.)

WILLIAM B. PARSONS, Rockport, Massachusetts:

Ancient fishing apparatus used at Rockport. (1.)

1. Old Stone Killick.
2. Old Bait Chopper.
3. Old Lantern.

THOMAS M. PEAKES, Edgartown, Massachusetts:

Log-book. (6.)

PERKINS AND SHURTLEFF, Portland, Maine:

1 box of compressed cod, 10 packages in case, 5 pounds each, with all large bones removed, compressed in rolls of a round shape, and ready for cooking. (26.)

BARNET PHILLIPS, New York City:

Essay on Prehistoric Fish-hooks. (57.)

WILLIAM PHILLIPS & SON, New Bedford, Massachusetts:

Brass and steel whaling-gun. (1.)

L. PICKERT & CO., Boston, Massachusetts:

Dry salted preparations. (26.)

Compressed Codfish, 5-pound paper packages.

Smoked preparations. (26.)

Blackwood's English Boned Herring, in tin.

Blackwood's Mount Desert Boneless Herring, in wood.

Finnan Haddies, 1-pound cans.

Pickle or brine salted preparations. (26.)

Corned Codfish, 5-pound oval cans.

Nonpareil Mess Mackerel, 5-pound cans.

Climax Mess Mackerel, 4-pound cans.

Isles of Shoals Mess Mackerel, 5-pound cans.

Diadem Mess Mackerel, 4-pound cans.

Preparations in spices, vinegar, &c. (26.)

Soused Mackerel, 1-pound, 2-pound, 3-pound and 4-pound cans.

Soused Brook Trout, 3-pound cans. (26.)

Broiled Mackerel, Mustard Sauce, 3-pound cans.

Broiled Mackerel, Tomato Sauce, 3-pound cans.

Labrador Herring, Tartar Sauce, 3-pound cans.

Hudson Bay Herring, Tomato Sauce, 3-pound cans.

Soused Brook Trout, 3-pound cans.

Fresh Codfish, 2-pound cans.

Fresh Mackerel, 2-pound cans.

Fresh Lobster, 1-pound and 2-pound cans.

Fresh Clams, 1-pound and 2-pound cans.

Clam Chowder, 3-pound cans.

Fried Smelts, 2-pound cans.

Fishermen's food in Cans. (22.)

Baked Beans, 3-pound cans.

New England Boiled Dinner, 3-pound cans.

Samples of brands of boneless fish and canned fish. (26.)

HENRY T. PICKING, Commander, U. S. N., Naval Secretary, Washington, District of Columbia:

Nickel-plated working model of the Courtenay Automatic Whistling Buoy. (6.)

CAPTAIN EBEN PIERCE, New Bedford, Massachusetts:

Bomb-lance for killing whales. (1.)

R. G. PIKE, Middletown, Connecticut:

Model of Spiral Fish-way, showing the economy of space and material, by spiral arrangement. (37.)

PORTLAND PACKING COMPANY, Portland, Maine:

Cooked preparations in cans. (26.)

Canned Lobsters.

Canned Clams.

POTTER & WRIGHTINGTON, Boston, Massachusetts:

Dry salted preparations. (26.)

Boneless Fish, Lion and Unicorn brand, in paper packages.

Minced Codfish, 1-pound cans.

Smoked preparations. (26.)

Boneless Herring, Lion and Unicorn brand, in cans.

Smoked Salmon, Lion and Unicorn brand, in cans.

Smoked Halibut, Lion and Unicorn brand, in cans.

Pickle or brine salted preparations. (26.)

Canned Salt Mackerel, Lion and Unicorn Brand, 5-pound oval cans.

Prize Mess Mackerel, 5-pound oval cans.

Minot's Light Mess Mackerel, 4-pound oval cans.

Preparations in spices, vinegar, &c. (26.)

Fresh Soused Mackerel in mustard, 2-pound and 3-pound cans.

Spiced Ocean Trout, 2-pound and 3-pound cans.

Soused Herring, 2-pound and 3-pound cans.

Herring in Tomato Sauce, 2-pound and 3-pound cans.

Eels in Jelly.

Mackerel in Tomato Sauce, 2-pound and 3-pound cans.

Ocean Trout in Tomato Sauce, 2-pound and 3-pound cans.

Cooked preparations in cans. (26.)

Fresh Mackerel, 1-pound and 2-pound cans.

Fresh Herring, 1-pound and 2-pound cans.

Fresh Ocean Trout, 1-pound and 2-pound cans.

Fresh Clams, 1-pound and 2-pound cans.

Fresh Codfish, 1-pound and 2-pound cans.

Fresh Lobsters, 1-pound and 2-pound cans.

Clam Chowder, 2-pound and 3 pound cans.

Codfish Chowder, 2-pound and 3-pound cans.

Fresh Cod, 1-pound cans.

Fishermen's food in cans. (22.)

Baked Beans, 1½-pound and 3-pound cans.

Roast Beef, 1-pound, 2-pound, and 3-pound cans.

Roast Mutton, 1-pound, 2-pound, and 3-pound cans.

Roast Turkey, 2-pound cans.

Roast Chicken, 2-pound cans.

Roast Veal, 2-pound cans.

Boiled Dinner, 2-pound and 3-pound cans.

EDWARD POTTS, Philadelphia, Pennsylvania:

Collection of dried and microscopic preparations of Freshwater Sponges. (43.)

PROCTER BROTHERS, Gloucester, Massachusetts:

File of "Cape Ann Advertiser." (60.)
Publications relating to the Fisheries. (60.)

G. W. PROCTOR, San Miguel, California:

Gun harpoon, used on the California coast. (1.)

JASPER PRYER, 143 Front street, New York City:

Samples of Fish Oils and their products. (29.)

F. W. PUTNAM, Cambridge, Massachusetts:

Publications on ichthyology. (60.)

JAMES QUINN, Quinnis, Oregon:

Cooked preparations in cans. (26.)
Canned Salmon.

QUINNIPIAC FERTILIZER COMPANY, New London, Connecticut:

Samples of Menhaden Guano. (29.)

1. Dry Fish Scrap.
   Percentages: Ammonia, 10½ per cent.; bone phosphate of lime, 15 per cent.
2. Dry Ground Fish Guano.
   Percentages: Ammonia, 10½ per cent.; bone phosphate of lime, 15 per cent.
3. Fish and Potash (ammoniated with fish).
   Percentages: Ammonia, 5 per cent.; bone phosphate of lime, 12 per cent.; available phosphoric acid, 5 per cent.; potash, 5 per cent.
4. Superphosphate (ammoniated with fish).
   Percentages: Ammonia, 3 per cent.; bone phosphate of lime, 25 per cent.; available phosphoric acid, 10 per cent.; potash, 2½ per cent.

RICHARD RATHBUN, United States National Museum, Washington:

Publications upon Aquatic Invertebrates. (60.)
Photographs of Brazilian corals in National Museum. (44.)

DR. CHARLES RAU, United States National Museum, Washington:

Publications on prehistoric fishing. (57.)

C. RECHT, 183 Bowery, New York City:

Foster's transparent Gimp Gut. (14–16.)

GEORGE RICARDO, Hackensack, New Jersey:

Box for hatching eggs of the smelt. (35.)

NATHAN RICHARDSON, Gloucester, Massachusetts:

Richardson Challenge Steerer. (6.) Steering-wheel, patented May 30, 1882.

RIDGWAY REFRIGERATOR COMPANY (LIMITED), Philadelphia, Pennsylvania:

Model of Refrigerator. (33.)

ROBERT RIDGWAY, United States National Museum, Washington:

Publications upon aquatic and fishing birds. (60.)

Prof. C. V. RILEY, Department of Agriculture, Washington:

Types of insects useful and injurious to fish and fishermen. (49.)

WILLIAM ROBERTS, Provincetown, Massachusetts:

Whaling harpoon. (1.)

G. S. ROBINSON, Fairhaven, Massachusetts:

Ear-bone of calf sperm-whale. (54.)

WM. S. ROBINSON & CO., New Haven, Connecticut:

Exhibit of tubs and kegs for packing oysters and fish. (33.)

2-gallon oak Oyster tub.
3-gallon oak Oyster tub.
4-gallon oak Oyster tub.
6-gallon oak Oyster tub.
10-gallon oak Oyster tub.
15-gallon oak Oyster tub.
¼-gallon Oyster keg.
½-gallon Oyster keg.
1-gallon Oyster keg.
2-gallon Oyster keg.
3-gallon Oyster keg.
4-gallon Oyster keg.
5-gallon Oyster keg.
¼ Anchovy keg.
½ Anchovy keg.
1 Anchovy keg.
¼ Russian Sardine keg.
½ Russian Sardine keg.
1 Russian Sardine keg.
1 Russian Sardine keg (white hoops).
⅛ Sardelle keg.
Herring keg.

ROSENSTEIN BROTHERS, 323 Greenwich street, New York City:

Preparations in spices, vinegar, &c. (26.)

Spiced Sardines, Royal brand, 1-pound cans.
Mustard Sardines, ¼-pound cans.
Mustard Sardines, 1-pound cans.

ROSENSTEIN BROTHERS, 323 Greenwich street, New York City:

Preparations in oil. (26.)

Oil Sardines, Debois brand, ¼-pound cans.
Oil Sardines, Louis Phillipe brand, ¼-pound cans.
Oil Sardines, Alfred Elienne brand, ½-pound cans.

Cooked preparations in cans. (26.)

Canned Lobsters, Royal brand, Eastport Packing Company.

RUSSELL MILLS COMPANY, Plymouth, Massachusetts, N. Boynton & Co., Agents, Boston, Massachusetts:

Samples of sail canvass. (5.)

RUSSIA CEMENT COMPANY, Gloucester, Massachusetts:

Exhibit of glue made from fish skins and materials used in its manufacture; also articles in the preparation of which fish is used. (29.)

1. Skins of Cusk and Codfish, from which fish-glue is obtained by cooking.
2. Residuum remaining in the bags after the glue has been pressed from the cooked skins.
3. Lee Page's Mucilage.
4. Russia Belting Cement; for belting, card clothing, and top roll manufacturers.
5. Lee Page's Carriage Glue; for fine wood work.
6. Lee Page's Liquid Glue; for family use.
7. Lee Page's Fish Glue, No. 12; for ordinary wood work, &c.
8. Lee Page's Fish Glue, No. 16; for boot and shoe manufacturers.
9. Lee Page's Fish Glue, No. 20 F; for gum labels, &c.
10. Lee Page's Fish Glue, No. 20 X; for woolen and carpet sizing.
11. Lee Page's Fish Glue, No. O. C., for table and stair oil cloths.
12. Lee Page's Bleaching Glue, No. S. S., as sold to straw-goods manufacturers.
13. Lee Page's Bleaching Glue, No. S. S., reduced to sizing as used by straw-goods manufacturers.
14. Ground fertilizer, the residuum from cooked fish skins after the glue has been removed.
15. Fish Sign, made by cementing pieces of wood with fish glue.
16. Part of carriage axle, wood and iron glued together.
17. Organ and Piano work, Spool and Bobbin work; wood and cloth glued together.
18. Leather work; samples of leather belting, shoe and shoe heel, in which glue is used.

RUSSIA CEMENT COMPANY, Gloucester, Massachusetts:

Exhibit of glue made from fish skins, etc.—Continued.

19. Paper work; samples of scrap-books and calendars prepared with fish glue.
20. Table Oil Cloths; sample book of various patterns of oil cloths.
21. Sample of Parquet flooring, made of pieces of wood glued together.
22. Samples of Straw Hats bleached and colored.
23. Samples of Gummed Paper.

JOHN A. RYDER, United States Fish Commission, Washington:

Publications upon the embryology of fishes and microscopic sections and photographs illustrative of the same. (60.)

JOHN A. SAWYER, New Bedford, Massachusetts:

Improved apparatus for the capture of the whale. (1.)
An old-fashioned scallop dredge. (2.)

CHARLES M. SCAMMON, Captain United States Revenue Marine:

One volume on Marine Mammals, together with account of the American whale-fishery. (60.)

S. SCHMIDT & BRO., New York City:

Smoked preparations. (26.)
Smoked Eels, in cans.
Smoked Salmon, in cans.
Smoked Sturgeon, in cans.
Smoked Smelts, in cans.
Smoked Herring, in cans.
Brat Herring, in cans.
Pickle or brine-salted preparations. (27.)
Caviare (Sturgeon roe).
Isinglass from Sturgeon. (27.)

CHARLES SCRIBNER'S SONS, New York City:

Game Fishes of the United States: (55.)

A series of twenty magnificent paintings of fishes and scenery, by S. A. KILBOURNE, with text by G. BROWN GOODE, assistant director United States National Museum, and assistant in the United States Fishery Commission; 10 parts in wrappers, not stitched, large folio, 1879-1881.

The plates are exact reproductions of the water-color paintings of S. A. Kilbourne, the studies for which were made from life, by the brook and on the shore. The details of form and structure are preserved with scientific accuracy, while color and life-action are shown with excellent effect. The work has been completed in ten parts, each part containing two plates, size 20½ inches by 14, mounted on heavy board, 28 inches by 22 inches; and the letter-press printed on rich-toned calendered paper. Wood-engravings are added.

CHARLES SCRIBNER'S SONS, New York City:

Game Fishes of the United States—Continued.

Mr. Kilbourne's paintings will open up a new world of delight to many who have never dreamed of the loveliness of the denizens of our own streams and bays. * * * Game fishes are those which, by reason of their cunning, courage, strength, beauty, and the sapidity of their flesh, are sought for by those who angle for sport with delicate fishing tackle. * * * In preparing the following essays, my endeavor has been to give a concise account of habits and geographical distribution. Descriptions would be superfluous; for Mr. Kilbourne has combined in his paintings artistic truth of coloring and scientific accuracy in the delineation of form. Fish-culture is frequently referred to, since its results are of great interest to the zoologist, the angler, and the public at large.—*From the preface of Mr. Goode.*

List of the Colored Plates.

Part I.—The Atlantic Salmon.
The Eastern Red-speckled Trout.
Part II.—The Spanish Mackerel.
The Black Basses.
Part III.—The Striped Bass.
The Red Snapper.
Part IV.—The Blue Fish.
The Yellow Perch.
Part V.—The Mackerel.
The Weak-fish or Southern Sea Trout.
Part VI.—The Pompano and its allies.
The Sea Bass or Southern Black Fish.
Part VII.—The King Fish and the Whiting.
The Sheeps-head and the Scuppaug.
Part VIII.—The Namaycush or Lake Trout.
The Bonito and the Tunnies.
Part IX.—The Red Fish.
The Grayling.
Part X.—The California Salmon.
The Muskellunge, Pike, and Pickerel.

Also a map, showing by means of colored lines the geographical distribution of the game fishes of Eastern North America, compiled from sketches by G. BROWN GOODE; and many engravings.

SEA WORLD PUBLISHING COMPANY, W. B. Hopson, manager and editor, Baltimore, Maryland:

File of "The Sea World and Packer's Journal." (60.)

HENRY SELLMAN, Camden, Maine. (Union Fish Company.):

Model of Sardine Factory. (25.)

SEWELL, DAY & CO., Boston, Massachusetts:

Samples of Cordage used on fishing vessels. (5.)

B. F. SHAW, Anamosa, Iowa:

Model of step and pool Fishway in spiral arrangement. (37.)

A. ZENO SHINDLER, United States National Museum:

Paintings of tortoise, snake, and fish from plaster casts. Three specimens. (51 and 52.) (The entire collection of reptiles and fishes in the collective exhibit of the United States was painted by Mr. Shindler.)

A. B. SHIPLEY & SONS, Philadelphia, Pennsylvania:

Fishing-rods. (14–16.)

Six-strip split Bamboo rod, $20.
Six-strip split Bamboo rod, $30.
Split Bamboo rod and reel in case.
Bethabara wood, 10-foot pole, $16 50.
Bethabara wood, pole 5½ ounces, $10.50.
Bethabara wood, 12-foot pole, $16.50.

Fishing reels. (14–16.)

70-yard Balance sliding click reel.
250-yard Fairmount click reel.
300-yard Balance handle, steel pivots, &c.

Waterproof fly line. (14–16.)

Brails, snoods, cat-fish nippers, and other articles used by anglers. (14–17.)

F. H. SIEWERD & BROTHER, Baltimore, Maryland:

Cooked preparations in cans. (26.)

Canned Oysters, Cove brand.

COMMANDER CHARLES D. SIGSBEE, United States Navy, Washington:

Apparatus employed in deep-sea research in the work of the United States Coast Survey. (40.)

JAMES M. SIMMS, Gloucester, Massachusetts:

Gang of standing rigging for fishing schooners. (5.)

I. A. SMALL, Provincetown, Massachusetts:

Implements used in the capture of the whale. (1.)

C. W. SMILEY, United States Fish Commission, Washington:

Publications relating to fish and fisheries. (60.)

T. W. SMILLIE, Photographer, United States National Museum, Washington, D. C.:

One screen of photographs of fishes and illustrative of the fisheries. (The entire collection of photographs in the collective exhibit of the United States was made by Mr. Smillie.) (51.)

EVERETT SMITH, Portland, Maine:

Model of inclined plane return fish-way. (37.)

SETH SMITH, Provincetown, Massachusetts:

Apparatus used in the whale-fishery, dog-fish capture, and mackereling. (1.)

SMITHSONIAN INSTITUTION, Washington, Spencer F. Baird, Secretary:

Publications relating to the Natural History of the waters. (60.)

LOUM SNOW & SON, New Bedford, Massachusetts:

Apparatus employed by whalemen, sealers, and sea-elephant hunters. (1.)

SOLUBLE PACIFIC GUANO COMPANY, Wood's Holl, Massachusetts:

Series of preparations illustrating the manufacture of Soluble Pacific Guano. (29.)

1. Crude Menhaden Scrap.
2. Dried and Ground Menhaden Scrap.
3. Muriate of Potash.
4. Nitrate of Soda.
5. Crude South Carolina Phosphate.
6. Crushed South Carolina Phosphate.
7. Ground South Carolina Phosphate.
8. Sicily Sulphur.
9. Stassfurth Kainite.
10. Soluble Pacific Guano, unscreened.
11. Soluble Pacific Guano, screened.

HENRY O. STANLEY, Dixfield, Maine:

Pencil sketch on birch-bark of a Rangeley Trout caught by Mr. Stanley October 10, 1877; weight 9½ pounds. (57.)

SILAS STEARNS, Pensacola, Florida:

Papers on Ichthyology. (60.)

E. M. STILLWELL, Bangor, Maine:

Can for transportation of young fish, and pump for aerating the water. (35.)

Painting on birch-bark of Grand Lake Stream Trout. (51.)

LIVINGSTON STONE, Charlestown, New Hampshire:

Series of eggs and young of the California Salmon, showing the daily growth from the newly-impregnated egg to the young fish several weeks old. (36.)

Apparatus used in hatching eggs of the various species of *Salmonidæ;* also box for rearing young Salmon. (35.)

JAMES G. SWAN, Port Townsend, Washington Territory:

Publications relating to the Indian fisheries of the Northwest coast. (Most of the fishery collection of the Northwest coast in the fisheries exhibit was made by Mr. Swan.) (60.)

JIREH SWIFT, New Bedford, Massachusetts:

Eskimo lance-head taken from a bowhead whale, North Pacific. (1.)

LIEUT. Z. L. TANNER, U. S. N., U. S. Steamer Albatross:

Deep sea Sounding Machine. (40.)

JAMES H. TARR, Gloucester, Massachusetts:

Cape Ann Copper Paint; used on bottoms of fishing vessels. (6.)

TARR & WONSON, Gloucester, Massachusetts:

Patent Copper Paint, used on bottoms of fishing vessels. (6.)

JAMES TAYLOR and JAMES V. COX, New Bedford, Massachusetts:

Box and ship's papers carried by bark "Gosnold," outward bound. (6.)

THOMAS TAYLOR, New Berne, North Carolina:

Can for the transportation of fish ova. (35.)

WILLIAM TAYLOR, Portland, Maine:

An improved sword-fish lily-iron. (1.)

S. THAXTER & SON, Boston, Massachusetts:

Exhibit of Eldridge's Charts and Coast Pilot. (6.)

No. 1.—THE VINEYARD SOUND AND NANTUCKET SHOALS, on a very large scale, with a Book of Sailing Directions. Persons using this chart will save the expense of employing a pilot. Price $5.

No. 2.—THE COAST OF NORTH AMERICA, from Cape Henry to Cape Sable, including the Chesapeake and Delaware Bays, and George's Shoals, on a large scale. Price $4.

No. 3.—CAPE COD TO BELLE ISLE, including the Bay of Fundy, Gulf of Saint Lawrence, and Banks of Newfoundland, with plans on a large scale of the Coast of Nova Scotia from Cape Canso to Pictou; the Coast of Cape Breton from Scatari to Sydney, and the Harbor of Saint John, New Brunswick, Halifax, and Miramichi. This is a new chart, prepared from the latest surveys, expressly for the Coal and Fishing trades. Price $5.

No. 4.—BOSTON HARBOR, on a large scale, with Sailing Directions. This chart affords a more practical guide to the various channels, passages, fishing-grounds, &c., of Boston Harbor, than any that has ever been issued. The bearings and distances of dangerous rocks and shoals, and the principal ranges of objects, are all given on the chart. Price, cloth, $1.

No. 5.—This is a new chart of LONG ISLAND SOUND from Newport to New York; with a Book of Sailing Directions, containing a full description of the dangers to be avoided in entering the various harbors of the Sound. Price $5.

No. 6.—LYNN TO HALIBUT POINT, with the harbors of Salem, Beverly, Marblehead, Manchester, Gloucester, Rockport, and Annisquam; also the stone quarries at Folly Cove, Lanesville, Bay View, &c., on a large scale. Price, cloth, $1.

No. 7.—CHESAPEAKE BAY, with the James, York, Rappahannock, and Potomac Rivers. This is a new chart, and the only one published which gives the rivers on a large scale on one sheet. Price $3.50.

S. THAXTER & SON, Boston, Massachusetts:

Exhibit of Eldridge's Charts and Coast Pilot—Continued.

No. 8.—MONTAUK POINT TO SAINT AUGUSTINE, with a plan of New York Bay and Harbor, on a large scale. Price $3.50.

No. 9.—SAINT AUGUSTINE TO NEW ORLEANS, with Florida Reefs, Bahama Banks, and entrance to Pensacola and Mobile Bays, on a large scale. Price $3.50.

No. 10.—BUZZARD'S BAY, on a very large scale, with a Book of Sailing Directions. Price $3.

No. 11.—NEW CHART OF DELAWARE BAY AND RIVER, on a large scale, in one sheet.

ELDRIDGE'S COAST PILOT. No. 1. Chatham to Saint John. Price $3.

Printed on the best quality of linen paper, and mounted on cloth to make them durable.

JOHN H. THOMPSON, New Bedford, Massachusetts:

Idol worshipped by natives of an island on the southwest coast of New Guinea. (21.)

TIFFANY & CO., New York City and Paris:

Exhibit of articles made of Alligator Skin. (32.)

Traveling-bags in great variety, and filled with articles for ladies and gentlemen.

Steamer bags.
Tourists' bags.
Railroad bags.
Pic-nic bags.
Dress-suit bags.
Hand bags.
Shopping bags.
Brief bags.
Belt bags for ladies.
Card cases.
Letter cases.
Porte-monnaies.
Pocket-books.
Bill books.
Visiting books and cases.
Blotters.
Railroad ticket cases.
Prescription books.
Memorandum books.
Nail-set cases.
Dressing-cases.
Scissor cases.
Hair-brush cases.
Cigarette cases.

TIFFANY & CO., New York City and Paris:

Exhibit of articles made of Alligator Skin—Continued.

Cigar cases.
Photograph cases, pocket.
Razor cases.
Note cases.
Jewelry cases.
Comb cases.
Work cases.
Writing cases.
Postage-stamp cases.
Cigar boxes.
Jewel boxes.
Handkerchief boxes.
Glove boxes.
Match boxes.
Photograph frames.
Photograph screens.
Coin pouches.
Eye-glass pouches.
Papeteries.
Music rolls.
Shawl straps.
Inkstands.
Belts for ladies.
Dog collars.
Portable mirrors.
Paper racks.
Gentlemen's key-belts.

H. L. TODD, draughtsman, United States Fish Commission:

Drawings of fishes for photo-engraving process, with proofs of same. (51.)

A. J. TOWER, Boston, Massachusetts:

Oiled clothing worn by fishermen. (21.)

a. Double goods, yellow. Fish brand.

"All garments bearing the Fish Brand trade-mark are provided with a zinc-metal button which cannot break or rust, which is attached by means of a brass-wire staple passing through the button and fabric, thence through a stay or small button on inside of garment, and the ends of the staple securely interlocked in such a manner as to render the accidental detaching of the button an impossibility. An invaluable consideration to seamen."

1. Officers' Long Coat, with inside sleeve, leather button-holes, patched elbow, epaulet on shoulder, &c.

This coat is an extra fine grade, and designed for officers of steamers and sailing vessels of all kinds. Price, $39 per dozen.

A. J. TOWER, Boston, Massachusetts:

Oiled clothing worn by fishermen—Continued.

2. Long Coat. Patched elbows, inside sleeves, and epaulets.

This coat is the most universally used of any of the styles manufactured. It is very popular with subordinate officers on shipboard, and with farmers and truckmen in all parts of the country. Price, $30 per dozen.

3. Jacket.

Designed with special reference to the requirements of fishermen, being short, waterproof and durable, and is the acknowledged favorite among the discriminating New England fishermen. Price, $15 per dozen.

4. Fisherman's Apron Pants.

Used in connection with the jacket above described, and also independently while dressing fish in dry weather. This garment is an absolute necessity with fishermen. Price, $15 per dozen.

5 Seaman's String Pants.

Used by seamen proper, being very conveniently adjusted to the wearer, an item of vast importance to the sailors of the merchant marine. The waist is made adjustable in size by means of a draw-string running through the waistband, hence the derivation of the name of the garment. Price, $14.50 per dozen.

6. Frock or Half Coat.

A medium length between the long coat and jacket, and used chiefly in connection with long (hip) gum boots, by oyster fishermen; also by sportsmen, with (hunting) gum boots; they are also used in connection with pants. Price, $22 per dozen.

7. Petticoat Barvell.

A very useful garment to fishermen, better serving the purpose of pants in warm weather, by permitting the free circulation of air around the body of wearer, and at the same time affording complete protection from wet when used in connection with gum boots. Price, $10.50 per dozen.

8. Barvell or Apron.

Used chiefly by fish packers, pork packers, tanners, oystermen, and in fact any class of workmen at a bench where exposed to wet or oil. To leather dressers the barvell is indispensable, inasmuch as the waterproofing compound is unaffected by acids or chemicals. Price $9.50 per dozen.

9. Sleeves.

Used in connection with petticoat and apron barvells, and are very convenient to fish packers in protecting shirt sleeves in winter, thereby obviating the necessity of turning shirt sleeves up, and exposing the bare arm in cold weather. Price, $4 per dozen.

b. Double goods, black. Fish brand.

10. Long Coat.

Inside sleeves, patched elbow, epaulet on shoulder, &c., made of same material as the yellow coat of same style, and preferred by some for use on land on account of color. Price, $30.50 per dozen.

A. J. TOWER, Boston, Massachusetts:

Oiled clothing worn by fishermen—Continued.

11. Jacket.

Used principally by fishermen and sailors; same style as the yellow jackets. Used also by miners. Price, $15.50 per dozen.

12. Fishermen's Apron Pants.

The same as corresponding pants in yellow before described: highly popular among fishermen. Price, $15.50 per dozen.

13. String Pants.

Same as the yellow string pants. Used by sailors and miners.

14. Petticoat Barvell.

Differs from the yellow petticoat barvell only in color. Price, $10.50 per dozen.

15. Common Barvell.

Same as the yellow barvell. Price, $9.50 per dozen.

16. Sleeves.

Same as the yellow. Price, $4 per dozen.

c. Oiled Hats.

17. "Cape Ann" or Northeaster.

The most comfortable hat made for fishermen and seamen generally. No fisherman would be without one. It is provided with a neck piece and ear laps lined with flannel, and affords a complete protection for these members in severe weather. This hat is black, with a medium soft crown and stiff rim. Price, $6.50 per dozen.

18. Soft yellow.

The same in shape as the "Cape Ann," and lined with flannel, with neck piece and earlaps. Crown and rim soft and can be put in coat pocket. This cap is worn principally by officers. It is a favorite with seamen on the great American lakes. Price, $6.50 per dozen.

19. Soft black.

Made in shape more like a common soft felt hat, and designed for use on land, and more principally by truckmen, farmers, &c. The material is lighter than used in the previously mentioned styles. Lined with red flannel and provided with neck piece and earlaps. Price, $6.50 per dozen.

20. Yellow and black Squam.

These hats are made to supply a cheap trade, and are worn principally by sailors. They are stiff crown and rim and lined with Canton flannel. Provided with earlaps only. Price, $3.50 der dozen.

21. Miners' (with leather).

This is a light-weight hat made in yellow and black, and worn exclusively by miners. It is provided with a leather on front, to which may be affixed the miner's lamp. The rim is straight and held in shape by reeds inclosed therein. The lining is of Canton flannel and provided with earlaps. Price, $3.75 per dozen.

UNITED STATES ALBUMEN MANUFACTURING COMPANY, Osterville, Massachusetts (Uno G. Hillman, superintendent):

Albumen made from fish eggs. (27.)

UNITED STATES BEACON LIGHT AND SIGNAL COMPANY, Philadelphia, Pennsylvania (J. M. Foster, agent):

Exhibit of beacons and signals. (6.)

UNITED STATES DEPARTMENT OF THE INTERIOR:

CENSUS OFFICE; Tenth Census of the United States. (C. W. Seaton, Superintendent.)

Statistics relating to the fisheries. (60.)

Reports and maps illustrating the condition of the United States in 1880. (60.)

UNITED STATES PATENT OFFICE.

List of patents relating to the fisheries complete to 1883. (60.)

UNITED STATES NATIONAL MUSEUM, Spencer F. Baird, Director, Washington:

Proceedings and bulletins containing numerous papers relating to the natural history of fish and other aquatic animals. (60.)

The collections of the National Museum have been extensively drawn upon in the preparation of the collective exhibit of the United States, in accordance with the provisions of the law authorizing the participation of the United States in this exhibition.

UNITED STATES DEPARTMENT OF THE NAVY:

BUREAU OF NAVIGATION—Hydrographic Office.

Charts of the Atlantic and Pacific coasts of North America. (6.)

NAUTICAL ALMANAC OFFICE.

Nautical Almanacs. (6.)

American Ephemeris. (6.)

UNITED STATES DEPARTMENT OF THE TREASURY:

UNITED STATES LIFE-SAVING SERVICE, Sumner J. Kimball, Superintendent.

Exhibit of apparatus and publications used by the service. (9.)

A.—Life Boats.

I.—New Jersey Life Boat for sandy beaches.

II.—The Long Island Life Boat for sandy beaches.

III.—Massachusetts Life Boat for rocky and shingly beaches.

IV.—The Dobbins Life Boat, self-righting, self-bailing, and self-ballasting, used at stations adjacent to harbors where there is a sheltered place for landing.

B.—The American Life Car, about 12 feet long. Will transport from a wreck to the shore at each trip six people, protecting them from exposure to the weather.

C.—Beach Apparatus Cart. Used at all stations of the Life-Saving Service, and loaded with all apparatus for making connections from shore to wreck, including gun, hawser, whips, breeches buoy, and shot-line.

The gear used with the apparatus cart is serviceable with either breeches buoy or life-car.

UNITED STATES DEPARTMENT OF THE TREASURY:

Exhibit of apparatus and publications, etc.—Continued.

D.—Life-Saving Apparatus.
I. Merryman's Rubber Suit.
II. Life-Preserving Apparatus.

E.—Old and new types of beach ordnance used in making connections with wrecks.*

F.—The illustrations of the patrol system, including patrol checks and other outfits.

G.—Shot lines and other cordage used in the service.

H.—Drawings and specifications of Life Boat Stations at various points on the coasts of the Atlantic, Pacific, and Great Lakes.†

I.—Medicine chest and other appliances for resuscitating the wrecked.

K.—Papers and documents used in the service or explanatory of its work.

L.—A collection of paintings, illustrating the operations of the service; exhibited by the Century Company of New City.

UNITED STATES COAST AND GEODETIC SURVEY, J. E. Hilgard, Superintendent.

Collection of about one hundred and twelve charts published by the Survey, being charts of the Atlantic and Pacific coasts of North America. (6.)

Divisions A, B, and 14 of the Atlantic Coast Pilot. (6.)

Apparatus for the scientific investigation of the waters—densimeter and salinometer—invented by Professor J. E. Hilgard. (40.)

LIGHT-HOUSE BOARD.

Map showing the positions of the Life Saving and Light Stations of the United States. (9.)

Charts of the following Light-House Districts: First, second, third (including Lake Champlain), fourth, fifth, sixth, seventh, eighth, eleventh, twelfth, and thirteenth. (6.)

Reports of the Light-House Board for the years 1872, 1873, 1874, 1875, 1876, 1877, 1878, 1879, 1880, 1881, and 1882. (60.)

Drawings and Specifications for Light-Houses, Beacons, Buoys, Light-Vessels, and Light-House and Buoy Tenders. 6 volumes. (6.)

---

*This gun was the first ever fired in the American Life-Saving Service, and was instrumental in saving 251 lives from the English ship "Arychat."

† The location of these stations is marked with green circles on the large map furnished by the Treasury Department.

UNITED STATES DEPARTMENT OF THE TREASURY:

LIGHT-HOUSE BOARD—Continued.

Pictures of Light-Houses, Tenders, Light-Vessels, etc.: (6.)

First-order Light-House on Thatcher's Island, Cape Ann, sea coast of Massachusetts. (Photograph.)

Second-order Light-House on Minot's Ledge, sea coast of Massachusetts. (Oil painting.)

Fourth-order Light-House on Southwest Ledge, Long Island Sound, Connecticut. (Water color.)

Day or Unlighted Beacon on Sea Flower Reef, Long Island Sound, Connecticut.

Screw-pile Light-House at Cedar Point, Potomac River, Virginia. (Photograph.)

Screw-pile Light-House on Thimble Shoal, Hampton Roads, Virginia. (Indian ink.)

First-order Light-House on Cape Henry, entrance to Chesapeake Bay, Virginia. (Water color.)

Second-order Light-House on Hunting Island, sea coast of South Carolina, entrance to Saint Helena Sound. (Photograph.)

Rear Beacon of Paris Island Range. Guide into Port Royal Sound, South Carolina. (Water color.)

First-order Light-House at Saint Augustine, sea coast of Florida. (Photograph.)

First-order Light-House on Fowey Rocks, sea coast of Florida. (Water color.)

Fourth-order Light-House at entrance to Calcasieu River, Gulf coast of Louisiana. (Photograph.)

Western River Stake Light. (Water color.)

Third-order Light-House at Cleveland, Ohio. (Water color.)

Second-order Light-House at Grosse Pointe, Illinois. (Photograph.)

Second-order Light-House on Stannard's Rock, Lake Superior, Michigan. (Water color.)

First-order Light-House at Piedras Blancas, sea coast of California. (Indian ink.)

First-order Light-House at Pigeon Point, sea coast of California. (2 photographs.)

Fourth-order Light-House on Mare Island, entrance to Straits of Karquines, California. (Indian ink and sepia.)

First-order Light-House at Point Reyes, sea coast of California. (Photograph.)

First-class Light Vessel with Steam Fog Whistle. (Photograph.)

Light-House Tender "Dahlia." (Indian ink.)

UNITED STATES DEPARTMENT OF THE TREASURY:

LIGHT-HOUSE BOARD—Continued.

Light-House Tender "Manzanita." (Water color.)

Models. (6.)

Second-order Light-House on Minot's Ledge, sea coast of Massachusetts.

Light Vessel No. 40 on Five Fathom Bank, entrance to Delaware Bay.

First-order Light-House on Fowey Rocks, sea coast of Florida. Scale, $\frac{3}{4}$ inch to 1 foot.

Specimen of Coral from Fowey Rocks, Florida.

First-order Light-House on Sand Key (near Key West), Florida. Scale, $\frac{1}{2}$ inch to 1 foot.

Crib used in the construction of Spectacle Reef Light-House.

Coffer Dam used in preparing the reef and laying the lower courses of Spectacle Reef Light-House.

Builder's model of Light-Vessel.

Courtenay Automatic Whistling Buoy.

UNITED STATES DEPARTMENT OF WAR:

UNITED STATES ARMY SIGNAL SERVICE. W. B. Hazen, Brigadier and Brevet Major General, Chief Signal Officer, U. S. A.

List of instruments: (9.)

2 Barometers.

2 Maximum Thermometers.

2 Minimum Thermometers.

3 Exposed Thermometers, with supports and cup, muslin and wicking for wet bulb.

2 Water Thermometers.

1 Water Thermometer case with cord.

2 Anemometers, one for interior and one for exterior.

1 Self-register, double.

1 Barometer, self-registering, Eccard's (Transmitter and Recorder).

1 Wind Vane, large, with attachment complete (one used at Paris).

3 Rain-gauges—one copper, one galvanized iron, and one small size.

1 Signal Service Telescope.

1 Signal Service telescope holder.

1 Signal Service marine glass.

2 Call-boxes.

2 Phones and 2 Transmitters, Eccard's.

1 Anemometer Post, $4\frac{1}{2}$ feet high.

1 Signal Lantern, red, large.

UNITED STATES DEPARTMENT OF WAR:

UNITED STATES ARMY SIGNAL SERVICE—Continued.

1 Signal Lantern, white, large.
100 feet Cautionary Signal Halyards.
1 Cautionary Signal Indicator.
1 Wreck Knapsack.
1 A Tent.
1 Folding table.
2 Folding chairs.
2 Box sounders.
2 pairs Pliers.
1 Dash Lantern.
1 Cable box for coast line.
1 Testing box-line.
1 Tool box, Signal Service.
1 Banner, silk, embroidered, Signal Service, U. S. A.
1 set of flags, international.
1 set of flags, life-saving.
2 Flags, 8 feet, red, cautionary.
2 Flags, 6 feet, red, cautionary.
2 Flags, 8 feet, white, cautionary.
2 Flags, 6 feet, white, cautionary.
2 Signal Kits, complete, with 2-feet flags.
1 Circuit map, framed.
1 Map, showing cautionary display stations, framed.
1 Map, enlarged, sea-coast line, framed.
1 Map, large, weather.
1 set Annual Reports, C. S. O., bound.
1 set International Bulletins, bound.
1 set Monthly Weather Reviews, bound.
1 set Daily Bulletins, &c., bound.
1 set Tri-daily Weather maps, bound, large.
1 set Professional Papers.
1 set Signal Service notes.
6 Cipher books, 6 sets cipher cards.
6 Instructions to Observers.
12 Instructions to Voluntary Observers.
1 Signal Service Manual.
6 Manuals, Military Telegraph, latest edition, and Instructions for constructing Military Telegraph Lines.
1 Army Regulations.
1 set Telescope blanks (filled out) for transmitting cautionary signal orders, showing method of ordering signals *up* or *down*, with explanatory messages, giving character of storm.

UNITED STATES DEPARTMENT OF WAR:

UNITED STATES ARMY SIGNAL SERVICE—Continued.

Manifold forms and carbon paper.

1 set of manifold forms 107, filled out.
1 set of manifold Press Reports, filled out.
1 set of manifold River Bulletins, filled out.

VAN ALTENA & SCHELTUS, Milwaukee, Wisconsin:

Samples of "The connecting sinker or fish-hook holder. (14–16.)

A contrivance "that can be used for the double purpose of connecting or disconnecting, in a twinkling, the hook, catgut, or snell with the line, and also serving as a sinker at the same time, thereby having the great advantage of avoiding the trouble and annoyance of tying and untying the string on and off the hook, &c." Prices for 1883: No. 1 (smallest size), $3.50 per dozen; No. 2 (middle size), $4 per dozen; No. 3 (largest size), $4.50 per dozen.

PROF. A. E. VERRILL, Yale College, New Haven, Connecticut:

Publications upon marine invertebrates and deep-sea research. (60.)

ADOLPH VOSS, Gloucester, Massachusetts:

Bait mill. (6.)

Boom-crotch supporter. (6.)

(See Collective exhibit.)

O. C. VOSS, Gloucester, Massachusetts:

Snug-stow anchor. (6.)

DR. C. A. WHITE, United States Geological Survey, Washington:

Monograph of the land and fresh-water fossil mollusks of North America, containing essay upon the evolution of fresh-water mollusks and fishes from marine forms. (56.)

W. A. WILCOX, Secretary Boston Fish Bureau, Boston, Massachusetts:

Exhibits showing methods of reporting the statistics of the fish markets of New England. (60.)

Reports of the Boston Fish Bureau. (60.)

These reports are issued daily (during the busy fishing season several times a day); also, weekly, monthly, and annually. They contain receipts of all fish arriving in Boston, both foreign, domestic, and from fishing vessels. Receipts of fish at all the leading out-posts are daily reported; movements of the fish and fishing fleets, from day to day; success and prospects of the catch; market quotations of sales are daily reported by telegraph from all important localities, with reports from agents and correspondents at all leading ports in the United States and British Provinces of all matters of interest in connection with the fishing industry; also, weekly statistics and comparisons of receipts, catch, prices, &c., with former years.—*W. A. Wilcox.*

WILCOX, CRITTENDEN & CO., Middletown, Connecticut:

Boat and vessel fittings, old and new styles, in great variety. (6.)

JOSEPH C. WILLETTS, Skaneateles, New York:

Angler's Rack for carrying blankets, guns, &c. (19).
Angler's Home-made creel. (19.)

C. A. WILLIAMS, New London, Connecticut:

Implements used in the whale and seal fisheries. (1.)

J. & W. R. WING, New Bedford, Massachusetts:

Slab of baleen or whalebone from Bowhead whale (*Balæna mysticetus*) taken in Pacific Arctic Ocean by bark Fleetwing, in May, 1882. (32.)

LIEUT. FRANCIS WINSLOW, United States Navy, United States Fish Commission, Washington:

Publications, charts, and photographs illustrating the natural history of the oyster and oyster-culture. (55, 60.)

WOLFF AND RIESING, Eastport, Maine:

Preparations in oil. (26.)
Oil sardines.
Preparations in spices, vinegar, &c. (26.)
Mustard sardines.
Marinée sardines.

GEORGE WOLTZ, Washington:

Model of Potomac shad-lighter. (4.)

EVERETT P. WONSON, Gloucester, Massachusetts:

Exhibit of stuffed fishes, prepared by Davidson's method of Ichthytaxidermy. (51.)
1. Codfish.
2. Norway Haddock.
3. Fresh-water Perch.

REUBEN WOOD, Syracuse, New York:

The Reuben Wood Trout-fly. (15.)
The Reuben Wood Bass-fly. (16.)

LIEUT. WOOD, United States Navy, United States steamer Fish Hawk:

Self-detaching apparatus for lowering small boats. (6.)

WOODBURY MILLS, Baltimore, Maryland:

Samples of canvas used on fishing vessels. (5.)

JAMES WORRALL, Columbia, Pennsylvania:

Model of sluice fish-way. (37.)

ISAAC H. WRIGHT, Baltimore, Maryland:

Submerged hatching box, with float for suspending it at any depth below the surface. (35.)

WILLIAM G. WROTEN, Maryland:

Bucket for transporting and hatching fish ova. (35.)

JOHN WYETH & BROTHER, Philadelphia, Pennsylvania:

Fluid Extract Sea-Wrack (*Fucus vesiculosus*); Bladder wrack, used for reducing morbid obesity or excessive fatness. (32.)

CONCORDANCE

TO THE

OFFICIAL CLASSIFICATION

FOR THE USE OF THE JURIES.

NOTE.

In the collective exhibit of the United States are included many articles which are labeled with the names of the persons from whom they were obtained. These are not, as a rule, entered for competition.

In the following list are included the names of all exhibitors who will be permitted to receive awards or special mention from the juries.

The artists and preparators by whom the pictures, photographs, casts, stuffed specimens, lay models, &c., have been prepared, may be classed as exhibitors. A list of their names is given at the beginning of this catalogue.

CLASS I.—FISHING.

SECTION I.—SEA FISHING.

DIVISION 1.

(1.) Gear of every description and of all nations used in Trawl, Herring, Long Line, Hand Line, and every other mode or system of Fishing, including all Nets, Lines, Hooks, Harpoons, Tackle, &c., employed in the same.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 47, 48, 50, 51, 52, 53, 59, 60, 61, 62, 63, 64, 67, 68, 69, 70, 72, 73, 74, 75, 78, 80, 81, 82, 83, 115, 116, 117, 118, 120, 121.

F. S. ALLEN, New Bedford, Massachusetts.
AMERICAN NET AND TWINE COMPANY, Boston, Massachusetts.
JAMES BARTON, New Bedford, Massachusetts.
JONATHAN BOURNE, New Bedford, Massachusetts.
JUNIUS A. BRAND, Norwich, Connecticut.
JAMES TEMPLE. BROWN, United States National Museum, Washington.
LUTHER COLE, New Bedford, Massachusetts.
PAUL E. COLLINS, Boston, Massachusetts.
D. CONNELL, Provincetown, Massachusetts.
STEPHEN COOK, Provincetown, Massachusetts.
PATRICK CUNNINGHAM, New Bedford, Massachusetts.
J. W. DRESSER, Castine, Maine.
JAMES D. DRIGGS, New Bedford, Massachusetts.
SELMAR EGGERS, Sr., New Bedford, Massachusetts.
SELMAR EGGERS, Jr., New Bedford, Massachusetts.

HENRY W. ELLIOTT, Washington, District of Columbia.
DANIEL KELLEHER, New Bedford, Massachusetts.
THOMAS KNOWLES & Co., New Bedford, Massachusetts.
LAWRENCE & Co., New London, Connecticut.
WILLIAM LEWIS, New Bedford, Massachusetts.
JOHN MCCULLOUGH, New Bedford, Massachusetts.
MACKEY & PINDAR, New Bedford, Massachusetts.
JOSEPH B. MACY, Nantucket, Massachusetts.
C. B. MARCHANT, Edgartown, Massachusetts.
H. W. MASON, New Bedford, Massachusetts.
GEORGE MERCHANT, Jr., Gloucester, Massachusetts.
NEW BEDFORD CORDAGE COMPANY, New Bedford, Massachusetts.
NICKERSON & BAXTER, Boston, Massachusetts.
JAMES C. OSBORNE, Edgartown, Massachusetts.
SAMUEL OSBORNE, Jr., & SONS, Edgartown, Massachusetts.
THOMAS B. PADDOCK, Nantucket, Massachusetts.
Capt. WILLIAM B. PARSONS, Rockport, Massachusetts.
WILLIAM PHILLIPS & SON, New Bedford, Massachusetts.
Capt. EBEN PIERCE, New Bedford, Massachusetts.
G. W. PROCTOR, San Miguel, California.
WILLIAM ROBERTS, Provincetown, Massachusetts.
JOHN A. SAWYER, New Bedford, Massachusetts.
I. A. SMALL, Provincetown, Massachusetts.
SETH SMITH, Provincetown, Massachusetts.
LOUM SNOW & COMPANY, New Bedford, Massachusetts.
JIREH SWIFT, New Bedford, Massachusetts.
WILLIAM TAYLOR, Portland, Maine.
C. A. WILLIAMS, New London, Connecticut.

DIVISION 2.

(2.) Oyster Dredges, Crab, Lobster, Prawn, &c., Pots, and other appliances for catching fish of this description.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 49, 71, 73, 74, 75, 76, 83.

BENJAMIN BAKER, 2d, New Bedford, Massachusetts.
WILLIAM P. HAYWOOD, West Creek, Ocean County, New York.
JOHN A. SAWYER, New Bedford, Massachusetts.

(3.) Fishing Craft of all nations; models and representations of the same.

DIVISION 3.

(i.) Steam Fishing vessels and steam carriers.

United States Commission of Fish and Fisheries. Collective Exhibits. Groups 84, 87, 156, 157.

JOSEPH W. COLLINS, Gloucester, Massachusetts.

DIVISION 4.

(ii.) Fishing vessels and boats other than steam vessels.
United States Commission of Fish and Fisheries. Collective Exhibit. Groups 84, 85, 86, 87, 88, 98, 114.
J. H. BARTLETT & SONS, New Bedford, Massachusetts.
J. W. COLLINS, Gloucester, Massachusetts.
H. & S. COOK, Provincetown, Massachusetts.
AL. FOSTER, New York city.
THOMAS A. IRVING, Provincetown, Massachusetts.
GEORGE WOLTZ, Washington.

DIVISION 5.

(4.) Ropes and canvas suitable to fishing vessels.
United States Commission of Fish and Fisheries. Collective Exhibit. Groups 89, 90.
J. T. DONNELL & Co., Bath, Maine.
CHRESTEN NELSEN, Gloucester, Massachusetts.
OLD COLONY MILLS, Plymouth, Massachusetts.
RUSSELL MILLS COMPANY, Plymouth, Massachusetts.
SEWELL, DAY & Co., Boston, Massachusetts.
JAMES M. SIMMS, Gloucester, Massachusetts.
WOODBURY MILLS, Baltimore, Maryland.

DIVISION 6.

(5.) Steam Capstans, Compasses, Barometers, Telescopes, Lights, Lamps, Fog Horns, Systems of Signaling at night for Fishing Fleets and Vessels, Electric Lights, Luminous Paint, and other equipment of Fishing Vessels, Charts for Fishermen.
United States Commission of Fish and Fisheries. Collective Exhibit. Groups 42, 43, 91, 92, 93, 94, 95, 96, 97, 99.
UNITED STATES NAVY, HYDROGRAPHIC OFFICE.
UNITED STATES NAVY, NAUTICAL ALMANAC OFFICE.
UNITED STATES TREASURY, LIGHT-HOUSE BOARD.
UNITED STATES COAST AND GEODETIC SURVEY.
MAYHEW ADAMS, Chilmark, Massachusetts.
FREDERICK S. ALLEN, Cuttyhunk, Massachusetts.
AMERICAN SHIP WINDLASS COMPANY, Providence, Rhode Island.
ATWOOD BROS., Clayton, New York.
BAGNALL & LOUD, Boston, Massachusetts.
JOHN BLISS & Co., New York City.
CHARLES CARPENTER, Kelley's Island, Ohio.
JAMES B. CLARK, Chester, Connecticut.

HENRY CLAY, New Bedford, Massachusetts.
J. W. COFFIN, Edgartown, Massachusetts.
JOSEPH W. COLLINS, Gloucester, Massachusetts.
FRANK E. DAVIS, Gloucester, Massachusetts.
Mrs. E. A. GANNETT, Edgartown, Massachusetts.
JOHN P. KNOWLES, 2d, New Bedford, Massachusetts.
JOHN W. NORTON, Edgartown, Massachusetts.
E. W. PAGE & Co., New York City.
THOMAS M. PEAKES, Edgartown, Massachusetts.
Commander HENRY T. PICKING, United States Navy.
NATHAN RICHARDSON, Gloucester, Massachusetts.
JAMES H. TARR, Gloucester, Massachusetts.
TARR & WONSON, Gloucester, Massachusetts.
JAMES TAYLOR & JAMES V. COX, New Bedford, Massachusetts.
S. THAXTER & SON, Boston, Massachusetts.
UNITED STATES BEACON LIGHT AND SIGNAL COMPANY, Philadelphia.
ADOLF VOSS, Gloucester, Massachusetts.
O. C. VOSS, Gloucester, Massachusetts.
WILCOX, CRITTENDEN & Co., Middletown, Connecticut.
LIEUTENANT WOOD, United States Navy, United States steamer Fish Hawk.

DIVISION 7.

(6.) Models of Harbors, Piers, and Slips, for Fishing purposes.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 77, 112, 124.

HIGGINS & GIFFORD, Gloucester, Massachusetts.

DIVISION 8.

(7.) Fishing Tackle and Netting in different stages of preparation, and machinery used for working up the raw material.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 67.

AMERICAN NET AND TWINE COMPANY.

WILLIAM J. HOOPER SONS (Baltimore Twine and Net Company), Baltimore, Maryland.

H. & G. W. LORD, Boston, Massachusetts.

DIVISION 9.

(8.) Life Boats, their equipment, and life-saving apparatus of every description.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 86, 97.

UNITED STATES TREASURY, LIFE-SAVING SERVICE.

UNITED STATES ARMY, SIGNAL SERVICE.
FREDERICK S. ALLEN, Cuttyhunk, Massachusetts.
CENTURY COMPANY, New York City.
HIGGINS & GIFFORD, Gloucester, Massachusetts.
MARSHALL H. HOLMES, Philadelphia, Pennsylvania.
MASSACHUSETTS HUMANE SOCIETY.
THE MILLER BERTH AND LIFE-SAVING MATTRESS COMPANY, Boston, Massachusetts.
H. D. OSTERMOOR & SON, New York City.

DIVISION 10.

(9.) Appliances and methods for breaking the force of the sea at the entrance of Harbors and elsewhere.

DIVISION 11.

(10.) Methods of communication from the shore to Light-Ships and Fishing Fleets by submarine cables.

DIVISION 12.

(11.) Methods of protecting Submarine Cables from injury by Fishing Operations. (Illustrated by models and drawings.)

SECTION II.—FRESH-WATER FISHING.

DIVISION 13.

1. Salmon Nets and fixed appliances for catching *Salmonidæ* in all their varieties.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 49, 67, 68, 69, 70, 72.

DIVISION 14.

2. Salmon Rods, Reels, Lines, Artificial Flies and Baits, Gaffs, Spears, Creels, &c.

CONROY & BISSETT, New York City.
L. S. HILL & CO., Grand Rapids, Michigan.
WILLIAM MILLS & SON, New York City.
WILLIAM MITCHELL, New York City.

DIVISION 15.

3. Trout Rods, Reels, Landing Nets, Lines, Artificial Flies, Baits, Baskets, Bags, &c.

CONROY & BISSETT, New York City.
WAKEMAN HOLBERTON, New York City.
WILLIAM MILLS & SON, New York City.
LOOMIS, PLUMB & CO., Syracuse, New York.
REUBEN WOOD, Syracuse, New York.

DIVISION 16.

4. Pike, Barbel, and other Coarse Fish-Rods, Reels, and Tackle, Artificial Spinning Baits, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 47, 48, 52, 53, 54, 55, 58, 59, 61, 62, 65, 66, 80.

CONROY & BISSETT, New York City.
L. S. HILL & CO., Grand Rapids, Michigan.
WAKEMAN HOLBERTON, New York City.
LOOMIS, PLUMB & CO., Syracuse, New York.
JOHN MANN & CO., Syracuse, New York.
B. C. MILAM, Frankfort, Kentucky.
WILLIAM MILLS & SON, New York City.
WILLIAM MITCHELL, New York City.
B. F. NICHOLS, Boston, Massachusetts.
C. RECHT, New York City.
A. B. SHIPLEY & SONS, Philadelphia.
JAMES G. SWAN, Port Townsend, Oregon.
VAN ALTENA & SCHELTUS, Milwaukee, Wisconsin.
REUBEN WOOD, Syracuse, New York.

DIVISION 17.

5. Traps, Nets, Bucks, Wheels, and all kinds of apparatus for catching Eels, Lampreys, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 48, 57, 70, 73, 75, 76.

A. B. SHIPLEY & SONS, Philadelphia, Pennsylvania.

DIVISION 18.

6. Hooks, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 50, 51, 52, 53, 54, 57.

MONROE A. GREEN, Rochester, New York.

DIVISION 19.

7. Anglers' Apparel of every description.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 103, 107.

ALBERT FERGUSON, New York City.
JOSEPH C. WILLETTS, Skaneateles, New York.

DIVISION 20.

8. Boats, Punts, Cobles, Collapsible, Portable, &c., in models or otherwise.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 86, 87, 88, 98.

JAMES L. EVERSON, Williamsburg, New York.
FRANK HOLMES, Chagrin Falls, Ohio.
N. A. OSGOOD, Battle Creek, Michigan.

CLASS II.—ECONOMIC CONDITION OF FISHERMEN.

DIVISION 21.

1. Apparel and Personal Equipment.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 100, 101, 102, 109, 110.

N. N. COOK, Provincetown, Massachusetts.
BENJAMIN F. DREW, Fairhaven, Massachusetts.
JOHN D. S. GILES.
J. E. HENDLEY, Washington, District of Columbia.
GEORGE KNOWLES, Provincetown, Massachusetts.
GEORGE MERCHANT, Jr., Gloucester, Massachusetts.
JOHN H. THOMPSON, New Bedford, Massachusetts.
A. J. TOWER, Boston, Massachusetts.

DIVISION 22.

2. Food and Medicine.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 104, 105.

J. T. BUTTRICK, New Bedford, Massachusetts.
W. K. LEWIS & BROTHERS, Boston, Massachusetts.
HENRY MAYO & CO., Boston, Massachusetts.
L. PICKERT & CO., Boston, Massachusetts.
POTTER & WRIGHTINGTON, Boston, Massachusetts.

DIVISION 23.

3. Models and Plans of Dwellings.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 106, 107.

DIVISION 24.

4. Contracts of Partnerships; Insurances of, Life, Boats, Gear, &c.; Benefit Societies.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 108.

CLASS III.—COMMERCIAL AND ECONOMIC.

DIVISION 25.

1. Preparation, Preservation, and Utilization of Fish.

(*a*) For edible purposes—

i. Models of fish-curing establishments. Methods of, and models and other representations of any appliances for, drying, curing, salting, smoking, tinning, cooking, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 79, 124, 125, 126, 127, 128, 129.
A. BOOTH, Baltimore, Maryland.
HENRY SELLMAN, Camden, Maine.

DIVISION 26.

ii. Fish dried, smoked, cured, salted, tinned, or otherwise prepared for food.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 130, 131, 132, 133, 134, 135, 136.
CHARLES ALDEN, Gloucester, Massachusetts.
ALBANY BEEF PACKING COMPANY, New York City.
MAX AMS, New York.
BADOLLET & Co. (and TILLAMOOK PACKING COMPANY), Astoria, Oregon.
ARTHUR H. BAILEY & Co., Boston, Massachusetts.
J. W. BEARDSLEY'S SONS, New York City.
A. BOOTH, Baltimore, Chicago, and Astoria.
BURNHAM & MORRILL, Portland, Maine.
CASTINE PACKING COMPANY, Castine, Maine.
CUTTING PACKING COMPANY, San Francisco.
DE BUTTS & DAGGETTS, Boston, Massachusetts.
HINE & Co., New York City.
WILLIAM HUME, Astoria, Oregon.
W. K. LEWIS & BROTHERS, Boston, Massachusetts.
MCMENAMIN & Co., Hampton, Virginia.
HENRY MAYO & Co., Boston, Massachusetts.
OREGON PACKING COMPANY (J. W. & V. Cook), Portland, Oregon.
PERKINS & SHURTLEFF, Portland, Maine.
L. PICKERT & Co., Boston, Massachusetts.
PORTLAND PACKING COMPANY, Portland, Maine.
POTTER & WRIGHTINGTON, Boston, Massachusetts.
JAMES QUINN, Quinnis, Oregon.
ROSENSTEIN BROTHERS, New York City.
S. SCHMIDT & BRO., New York City.
F. H. SIEWARD & BRO., Baltimore, Maryland.
WOLFF & RIESING, Eastport, Maine.

DIVISION 27.

iii. All products prepared from fish, such as oils, roes, isinglass, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 140, 147.
MAX AMS, New York City.

A. W. DODD & CO., Gloucester, Massachusetts.
S. SCHMIDT & BRO., New York City.
UNITED STATES ALBUMEN MANUFACTURING COMPANY, Osterville, Massachusetts.

DIVISION 28.

iv. Antiseptics suitable for preserving fish for food.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 127.

DIVISION 29.

(*b*) For other than edible purposes—

i. Oils, manures, and other products prepared from fish.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 149, 152.
W. A. ABBE, New Bedford, Massachusetts.
ALBANY BEEF PACKING COMPANY, New York City.
J. H. BARTLETT & SONS, New Bedford, Massachusetts.
CALEB COOK, Provincetown, Massachusetts.
A. W. DODD & CO., Gloucester, Massachusetts.
WINFIELD S. DUNAN, Baltimore, Maryland.
GLOUCESTER ISINGLASS AND GLUE COMPANY, Gloucester, Massachusetts.
HAVEN, WILLIAMS & CO., New London, Connecticut.
The GEORGE W. MILES COMPANY, Milford, Connecticut.
JASPER PRYER, New York City.
QUINNIPIAC FERTILIZER COMPANY, New London, Connecticut.
RUSSIA CEMENT COMPANY, Gloucester, Massachusetts.
SOLUBLE PACIFIC GUANO COMPANY, Wood's Holl, Massachusetts.

DIVISION 30.

ii. Methods of, and models, and other representations of appliances for, preparing oils and manures from fish.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 111, 113, 119, 124, 125, 128.

DIVISION 31.

iii. Sea and fresh-water pearl shells; mother-of-pearl manufactured; pearls sorted.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 144, 145.

DIVISION 32.

iv. Preparation and application of sponges, corals, pearls, shells, and all parts and products of aquatic animals, &c., to purposes useful and ornamental, with specimens.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 137, 138, 139, 140, 141, 142, 143, 146.

ALASKA COMMERCIAL COMPANY, San Francisco.
J. H. BARTLETT & SONS, New Bedford, Massachusetts.
H. C. CHESTER, Noank, Connecticut.
CHARLES A. COLE, Scituate, Massachusetts.
H. J. MAHRENHOLZ, New York City.
TIFFANY & Co., New York City and Paris.
J. & W. R. WING, New Bedford, Massachusetts.
JOHN WYETH & BRO., Philadelphia, Pennsylvania.

DIVISION 33.

2. Transport and sale of fish.

(*a*) Appliances for carrying fish and for preserving fish during transport or otherwise, and models of the same.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 122, 123, 128.

JAMES BEETLE, New Bedford, Massachusetts.
A. J. CHASE, Boston, Massachusetts.
MANN BROTHERS, Chicago, Illinois.
N. A. OSGOOD, Battle Creek, Michigan.
RIDGWAY PATENT REFRIGERATOR COMPANY (limited), Philadelphia.
WILLIAM S. ROBINSON & Co., New Haven Connecticut.

DIVISION 34.

(*b*) Models of fish-markets and appliances connected with the same.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 124.

EUGENE G. BLACKFORD, New York City.
FAIRBANKS & Co., New York City.
D. W. LOW, Gloucester, Massachusetts.

CLASS IV.—FISH CULTURE.

DIVISION 35.

1. Models or drawings of fish hatching, breeding, and rearing establishments, including oyster and other shellfish grounds, and all apparatus and implements connected with the same, and for transporting fish and fish ova. Food for fry.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 41, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163.

JAMES ANNIN, Jr., Caledonia, New York.
STEPHEN H. AINSWORTH, New York.

CHARLES G. ATKINS, Bucksport, Maine.
E. A. BRACKETT, Winchester, Massachusetts.
O. N. BRYAN, Occokeek, Maryland.
OREN M. CHASE, Detroit, Michigan.
H. C. CHESTER, Noank, Connecticut.
FRANK N. CLARK, Northville, Michigan.
A. S. COLLINS, Caledonia, New York.
W. G. DELAWDER, Easton, Maryland.
THOMAS B. FERGUSON, Washington, District of Columbia.
SETH GREEN, Rochester, New York.
MONROE A. GREEN, Rochester, New York.
MARSHALL MCDONALD, Washington, District of Columbia.
FREDERICK MATHER, New York.
JOEL C. PARKER, Grand Rapids, Michigan.
GEORGE RICARDO, Hackensack, New York.
E. M. STILWELL, Bangor, Maine.
LIVINGSTON STONE, Charlestown, New Hampshire.
THOMAS TAYLOR, New Berne, North Carolina.
ISAAC H. WRIGHT, Baltimore, Maryland.
WILLIAM G. WROTEN, Maryland.

DIVISION 36.

2 Representations illustrative of the development and progressive growth of fish.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 164, 165, 166.

JAMES ANNIN, Jr., Caledonia, New York.
CHARLES G. ATKINS, Bucksport, Maine.
FRANK N. CLARK, Northville, Michigan.
R. EDWARD EARLL, Washington, District of Columbia.
SETH GREEN, Rochester, New York.
MCKESSON & ROBBINS, New York City.
MARSHALL MCDONALD, Washington, District of Columbia.
LIVINGSTON STONE, Charlestown, New Hampshire.

DIVISION 37.

3. Models and drawings of fish passes and fish ladders.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 167.

CHARLES G. ATKINS, Bucksport, Maine.
E. A. BRACKETT, Winchester, Massachusetts.
JAMES D. BREWER, Muncy, Pennsylvania.
F. M. EVERLETH, Waldoboro, Maine.
MARSHALL MACDONALD, Washington, District of Columbia.
ROBERT G. PIKE, Middletown, Connecticut.

B. F. SHAW, Anamosa, Iowa.
EVERETT SMITH, Portland, Maine.
JAMES WORRALL, Columbia, Pennsylvania.

DIVISION 38.

4. Scientific investigation.

i. Models and drawing of diseases of fish, with special reference to their origin and cure.

DIVISION 39.

ii. Processes for rendering streams polluted by sewage and chemical and other works innocuous to fish life (illustrated by models and drawings).

United States Commission of Fish and Fisheries. Collective Exhibit. Group 167.

DIVISION 40.

iii. Physico chemical investigation into those qualities of salt and fresh water which affect aquatic animals; investigation of the bottom of the sea and of lakes, shown by samples; aquatic plants in relation to fishing, &c.; researches into the aquatic fauna (animals of the several classes preserved in alcohol or prepared, &c.); apparatus and implements used in such researches.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 36, 37, 38, 43, 170, 171, 172.

UNITED STATES COAST AND GEODETIC SURVEY.
UNITED STATES NAVY, HYDROGRAPHIC OFFICE.
ALEXANDER AGASSIZ, Museum of Comparative Zoology, Cambridge, Massachusetts.
Passed Assistant Engineer WILLIAM L. BAILIE, U. S. N., United States steamer Fish Hawk.
J. E. BENEDICT, United States steamer Albatross.
H. C. CHESTER, Noank, Connecticut.
J. E. HILGARD, Washington, District of Columbia.
Lieut. Z. L. TANNER, U. S. N., United States steamer Albatross.
EDWARD POTTS, Philadelphia, Pennsylvania.
Commander CHARLES D. SIGSBEE, U. S. N.

DIVISION 41.

5. Acclimatization of fish.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 153.

CLASS V.—NATURAL HISTORY.

DIVISION 42.

1. Specimens living (marine and fresh-water), fresh, stuffed, or preserved, casts, drawings, and representations of—

(*a*) Algæ arranged according to their various species and localities.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 34, 35.

Dr. W. G. FARLOW, Harvard College, Cambridge, Massachusetts.

DIVISION 43.

(*b*) Sponges, in their natural state.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 32, 148.

McKESSON & ROBBINS, New York City.

EDWARD POTTS, Philadelphia, Pennsylvania.

DIVISION 44.

(*c*) Corals, in their natural state, polyps, jelly-fish, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 31.

RICHARD RATHBUN, Washington, District of Columbia.

DIVISION 45.

(*d*) Entozoa.

DIVISION 46.

(*e*) Mollusca of all kinds and shells not included in Class III.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 21, 22, 23, 24, 25, 26, 27, 28.

J. H. EMERTON, Peabody Museum, Yale College, New Haven, Connecticut.

DIVISION 47.

(*f*) Starfishes, sea-urchins, holothuriæ.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 31.

DIVISION 48.

(*g*) Worms used for bait, or noxious; leeches, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 30.

DIVISION 49.

(*h*) Perfect insects and larvæ of insects which are destroyers of spawn or serve as food for fish.

United States Commission of Fish and Fisheries. Collective Exhibit. Group 56.

H. D. MCGOVERN, Brooklyn, New York.
C. V. RILEY, Washington, District of Columbia.

DIVISION 50.

(*i*) Crustacea of all kinds.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 29, 33.

F. A. LUCAS, Washington, District of Columbia.

DIVISION 51.

(*k*) Fish of all kinds.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 13, 20.

EUGENE G. BLACKFORD, New York City.
WALTER M. BRACKETT, Boston, Massachusetts (pictures).
BRUSH SWAN ELECTRIC LIGHT COMPANY, New York City.
Mrs. J. H. FREEMAN, Wellfleet, Massachusetts (pictures).
F. A. LUCAS, Washington, District of Columbia.
FRED MATHER, New York City.
A. ZENO SHINDLER, Washington, District of Columbia.
T. W. SMILLIE, Washington, District of Columbia.
E. M. STILWELL, Bangor, Maine.
H. L. TODD, Washington, District of Columbia (pictures).
EVERETT P. WONSON, Gloucester, Massachusetts.

DIVISION 52.

(*l*) Reptiles, such as tortoises, turtles, terrapins, lizards, serpents, frogs, newts, &c.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 7, 8, 9, 10, 11, 12.

RUDOLPHUS BEETLE, New Bedford, Massachusetts.
F. A. LUCAS, Washington, District of Columbia.
A. Z. SHINDLER, Washington, District of Columbia.

DIVISION 53.

(*m*) Aquatic and other birds hostile to fish or fishing.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 5, 6.

WM. T. HORNADAY, Washington, District of Columbia.
HENRY MARSHALL, Washington, District of Columbia.

DIVISION 54.

(*n*) Aquatic and amphibious mammalia (otters, seals, whales, &c.) and others detrimental to fish.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 1, 2, 3, 4.

ALASKA COMMERCIAL COMPANY, San Francisco, California.
WM. T. HORNADAY, Washington, District of Columbia.
GEORGE KNOWLES, Provincetown, Massachusetts.
G. S. ROBINSON, Fairhaven, Massachusetts.

DIVISION 55.

2. Works on Ichthyology, Maps Illustrating Geographical Distribution, Migration, &c., of Fishes and Spawn.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 39, 40, 41, 42, 43, 44, 45, 46, 173.

ALEXANDER AGASSIZ, Cambridge, Massachusetts.
J. A. ALLEN, Museum of Comparative Zoology, Cambridge, Massachusetts.
TARTLETON H. BEAN, National Museum, Washington, District of Columbia.
A. HOWARD CLARK, Washington, District of Columbia.
W. H. DALL, Washington, District of Columbia.
SILAS STEARNS, Pensacola, Florida.
G. BROWN GOODE, National Museum, Washington, District of Columbia.
DAVID S. JORDAN, Bloomington, Indiana.
FRED. MATHER, New York City.
CHARLES SCRIBNER'S SONS, New York City.
Lieut. FRANCIS WINSLOW, United States Navy.

DIVISION 56.

3. Specimens and representations illustrative of the relations between extinct and existing fishes.

Dr. C. A. WHITE, United States Geological Survey, Washington, District of Columbia.

CLASS VI.—HISTORY AND LITERATURE OF FISHING—FISHERY LAWS—FISH COMMERCE.

DIVISION 57.

1. Ancient fishing implements or their reproductions—Models—Pictures—Books—Emblems—Charters and seals of ancient fishermen guilds.

United States Commission of Fish and Fisheries. Collective Exhibit. Groups 168, 169, 173.

AMERICAN FISH CULTURAL ASSOCIATION, New York City.
CENTURY COMPANY, New York City.
Captain B. F. CONKLIN, Jamesport, New York.
FULTON MARKET FISHMONGERS' ASSOCIATION, New York City.
ICHTHYOPHAGOUS CLUB, New York City.
BARNET PHILLIPS, New York City.
Dr. CHARLES RAU, Washington, District of Columbia.
HENRY O. STANLEY, Dixfield, Maine.

DIVISION 58.

2. Fishery Laws of Different Countries.

DIVISION 59.

3. Copies of Treaties, Conventions, &c., dealing with International Fishery Relations.

DIVISION 60.

4. Reports, Statistics, and Literature of Fish, Fishing, and Fisheries.
United States Commission of Fish and Fisheries. Collective Exhibit. Group 173.
SMITHSONIAN INSTITUTION, Washington, District of Columbia.
UNITED STATES NATIONAL MUSEUM, Washington, District of Columbia.
UNITED STATES DEPARTMENT OF THE INTERIOR, CENSUS OFFICE, Washington, District of Columbia.
UNITED STATES DEPARTMENT OF THE INTERIOR, PATENT OFFICE, Washington, District of Columbia.
UNITED STATES DEPARTMENT OF THE TREASURY, BUREAU OF STATISTICS.
UNITED STATES COAST AND GEODETIC SURVEY, Washington, District of Columbia.
ALEXANDER AGASSIZ, Museum of Comparative Zoology, Cambridge, Massachusetts.
J. A. ALLEN, Museum of Comparative Zoology, Cambridge, Massachusetts.
AMERICAN ANGLER, New York City.
AMERICAN FIELD, Chicago, Illinois.
AMERICAN FISH CULTURAL ASSOCIATION, New York City.
JOHN BARTLETT, Cambridge, Massachusetts.
Dr. TARLETON H. BEAN, United States National Museum, Washington, District of Columbia.
A. HOWARD CLARK, United States National Museum, Washington, District of Columbia.

JOSEPH W. COLLINS, United States Fish Commission, Washington, District of Columbia.
Captain W. H. DALL, United States Coast Survey, Washington, District of Columbia.
R. E. EARLL, United States Fish Commission, Washington, District of Columbia.
HENRY W. ELLIOTT, Washington, District of Columbia.
Dr. W. G. FARLOW, Harvard University, Cambridge, Massachusetts.
WALTER FAXON, Museum of Comparative Zoology, Cambridge, Massachusetts.
J. WALTER FEWKES, Museum of Comparative Zoology, Cambridge, Massachusetts.
FOREST AND STREAM PUBLISHING COMPANY, New York.
OSCAR HARGER, Peabody Museum of Yale College, New Haven, Connecticut.
DAVID S. JORDAN, Indiana University, Bloomington, Indiana.
W. N. LOCKINGTON, Philadelphia, Pennsylvania.
MUSEUM OF COMPARATIVE ZOOLOGY, Cambridge, Massachusetts.
A. S. PACKARD, Jr., Providence, Rhode Island.
PROCTER BROTHERS, Gloucester, Massachusetts.
F. W. PUTNAM, Cambridge, Massachusetts.
RICHARD RATHBUN, United States National Museum, Washington, District of Columbia.
ROBERT RIDGWAY, United States National Museum, Washington, District of Columbia.
C. V. RILEY, United States Department of Agriculture, Washington, District of Columbia.
JOHN A. RYDER, United States Fish Commission, Washington, District of Columbia.
Captain C. M. SCAMMON, United States Revenue Marine, San Francisco, California.
CHARLES SCRIBNER'S SONS, New York City.
SEA WORLD PUBLISHING COMPANY, Baltimore, Md.
C. W. SMILEY, United States Fish Commission, Washington, District of Columbia.
SILAS STEARNS, Pensacola, Florida.
JAMES G. SWAN, Port Townsend, Washington Territory.
Professor A. E. VERRILL, Yale College, New Haven, Connecticut.
W. A. WILCOX, Secretary Boston Fish Bureau, Boston.
Lieutenant FRANCIS WINSLOW, U. S. N., United States Fish Commission, Washington, District of Columbia.
The Fish Commissions of the several States, as follows:

DIVISION 61.

5. Reports on Acclimatization of Fish, and of attempts in this direction.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

B.

COLLECTION

OF

ECONOMIC CRUSTACEANS, WORMS, ECHINODERMS, AND SPONGES.

BY

RICHARD RATHBUN,

Curator of the Department of Marine Invertebrates in the United States National Museum.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1883.

INTRODUCTION.

The fisheries of the United States included in this section gave employment, in 1880, to over 6,000 fishermen, during a longer or shorter season, yielding them a gross stock of more than $1,200,000. About 1,250 persons were employed in the canneries, and 500 were credited to the wholesale markets, but this does not include a large number of marketmen, who were also interested in other fisheries, from which they could not be separated in the enumeration. The cash capital invested, including the canning interests, was about $1,000,000. The details of the several fisheries are given below in brief.

CRUSTACEANS.

CRABS.

Over twenty species of Crabs belonging to the coasts of the United States are now regarded as of greater or less practical importance to mankind. The most valuable of these are the Blue Crab (*Callinectes hastatus*), Lady Crab (*Platyonichus ocellatus*), Stone Crab (*Menippe mercenarius*), and Rock Crabs (*Cancer irroratus* and *borealis*), of the east coast, and the Common Crab, Rock Crab, and Red Crab (*Cancer magister*,*antennarius*, *productus*), of the Pacific Coast. The remaining species are utilized simply as bait, or to a slight extent only as food.

The Blue Crab is the common edible Crab of the Atlantic Coast, and ranges from Massachusetts Bay to the Gulf of Mexico. The season for its fishery is of variable duration on different parts of the coast. At New York it lasts from May to October, while in Florida it begins as early as March and continues until December, or, if the weather be mild, through the entire winter. This Crab is eaten in both the hard and soft shell condition, but is greatly preferred, and commands a much higher price, when in the latter state. This is contrary to what holds true with all of the other species of Crabs upon our coast, as well as the Lobster, which are only eaten when hard-shell. However, Soft-shell Crabs are seldom taken in marketable quantities excepting on the New Jersey coast, whence New York derives the greater part of its supplies. The Crab fishery for New Jersey alone amounted to over $160,000, in 1880. The Blue Crab also forms an excellent bait.

Several different appliances are used in the capture of Blue Crabs,

the most common being the ordinary scoop or dip net, also called crab-net. For attracting the Crabs from depths not easily reached by means of the dip-net, the fishermen resort to baited lines, without hooks, which are used singly or made up into trawls. From a small boat, each fisherman is able to handle several single lines, which are hauled up at short intervals, the Crabs being secured in a dip-net as they approach the surface. The crab-trawl, or trot-line, measures 250 to 700 feet in length, and has small lateral lines arranged at short distances apart. There are several methods of setting it. One is to anchor each end by means of weights, and another to attach the ends to long poles, which are thrust down into the bottom. A man in a skiff rows continuously from end to end, hauling in the lateral lines and taking the Crabs as in the first instance. On the Louisiana coast, the trot lines are stretched along the beaches, the lateral lines being thrown out into the water and hauled in at regular intervals. Seines, hoop-nets, baited with meat, and clam tongs are also occasionally employed for catching Crabs. As the Soft Crabs remain in a semidormant condition, and will not take the bait, they are secured almost entirely by means of scoop-nets from the beaches, or in the hands. Floating cars are extensively employed in some localities for keeping the Hard Crabs until they shall have cast their shells and become soft. Crabs are generally shipped to market in boxes, baskets, or barrels, with or without packing. Small boxes are mainly preferred for the Soft Crabs, which are packed in very snugly in order that they may stand transportation without injury, and so that the moisture will not run too freely from the gills. The Crab catchers consist largely of women and children, especially in the Southern States.

In 1880, there were three Crab canneries in the United States, two being located at Hampton, Virginia, and one at Oxford, Maryland. Only Hard Crabs are canned, the supplies coming mainly from the neighborhood of the canneries. The process of canning Crabs is somewhat similar to that for lobsters, as practiced on the New England coast. The Crabs are boiled or steamed, after which the meats are removed from the hard parts and packed in one and two pound tins, the shells or carapaces being cleaned and sold with the meats, to serve as holders in making deviled Crabs. The refuse is used as a manure.

The Crab fisheries of the eastern coast of the United States, in 1880, amounted to $328,000 (fishermen's prices), of which the greater part belonged to New York, New Jersey, Delaware, Maryland, and Virginia. South of Virginia, on the Atlantic coast, the Crab fishery is of but slight importance, at present; on the Gulf coast it amounts to about $10,000 annually, and is mainly confined to Louisiana.

The Rock and Jonah Crabs (*Cancer irroratus* and *borealis*) are eaten only to a slight extent, probably for the reason that their range is coextensive with that of the lobster, which is much more favorably regarded as an article of food. *Cancer irroratus* is caught at the mouth of Boston Harbor, in small quantities, to supply the Boston markets. and both

species are taken for the Newport market, in Narragansett Bay. They are also both used as bait for several species of fish.

The Stone Crab (*Menippe mercenarius*) is very much esteemed for eating, but nowhere occurs in sufficient abundance to supply more than a limited demand. The shell of this Crab is thick and heavy, and the claws proportionately large, furnishing a generous supply of meat. The Stone Crab lives in holes in the mud, which it excavates, and in cracks between rocks, and is, therefore, somewhat difficult to capture. In taking them from their holes, which are sometimes two feet deep, the crabber thrusts down his arm, and seizing the occupant by the elbow of the nearest claw, draws him quickly out, allowing him to fall upon the ground, where he is better able to secure him without injury to himself. The Crab offers stout resistance, and is sometimes taken out piecemeal. The crabber occasionally resorts to digging out his prey. This species is rarely shipped away from the seaport towns, where it is taken, and is, therefore, seldom seen in the larger markets, excepting at Charleston, South Carolina, in the vicinity of which place it is abundant. On some parts of the Florida coast it furnishes the inhabitants with a considerable share of their food at certain seasons.

The Lady Crab (*Platyonichus ocellatus*) is occasionally taken for food on the Atlantic coast, in the same manner as the Blue Crab, but is rarely seen in the markets. In the Gulf of Mexico, and especially on the Louisiana coast, it is an important article of fishery, and large quantities are shipped to New Orleans every season. On the New England coast it is used as bait.

The crabs of lesser importance on the east coast of the United States are as follows:

The Fiddler Crabs (*Gelasimus*) serve as a bait in many localities throughout their range, and are said to be occasionally used as food. One species is destructive to the levees of the Mississippi River, at New Orleans, into which it burrows, in common with a species of crayfish (*Cambarus*).

The Oyster Crabs (*Pinnotheres ostreum*), which live as messmates in the shells of the American oyster, are highly esteemed as food, and are eaten along with the oyster, or cooked or pickled separately. Only the females live in the oyster, the males being free. In the restaurants of Fulton market, New York, where immense quantities of oysters are opened annually, it is sometimes customary to save the crabs for pickling. A related Crab (*P. maculatus*) occurs in the shells of the common mussel (*Mytilus edulis*) and the smooth scallop (*Pecten tenuicostatus*), and is also good eating; but as neither of these mollusks is taken for food, to any great extent, it is known only to naturalists.

The Green Crab (*Carcinus mænas*), which figures prominently in the fisheries of Europe, is only used as bait in this country, for which purpose it is favorably regarded on the southern coast of New England. The Mud Crabs (*Panopeus*,) and the Spider Crabs (*Libinia emarginata*

and *dubia*,) are also used as bait, especially on the coast of the Southern States. The Sand Bug or Bait Bug (*Hippa talpoida*) burrows into the sand of beaches at about the level of low tide, and is very frequently employed as bait from New Jersey southward. The Hermit Crabs (*Eupagurus*) are seldom, if ever, put to any use in this country, but several large species occur on our coasts in convenient places for securing them, and in the course of time they will probably come to be utilized.

Six species of Crabs are regarded as edible on the Pacific coast of the United States—the common market Crab (*Cancer magister*), Rock Crab (*Cancer antennarius*), Red Crab (*Cancer productus*), Kelp Crab (*Epialtus productus*), Yellow Shore Crab (*Heterograpsus oregonensis*), and Purple Shore Crab (*H. nudus*). Only the *Cancer magister* is now extensively used as food, although the other two species of the same genus are said to be equally good as regards flavor. The *magister* is, however, the most abundant species in those localities and depths which are most frequented by the fishermen, and also averages somewhat larger in size. It is captured mainly on the sandy beaches of San Francisco Bay, by means of seines and Crab nets, baited with fish and offal. The principal market is San Francisco. The season continues more or less throughout the year, but the summer catch is much larger than the winter. The Red and Rock Crabs are most abundant on the rocky shores of the northern side of the Golden Gate, where but little fishing is done. The *Cancers* are not, apparently, caught elsewhere for food on the Pacific coast. The Yellow and Purple Shore Crabs are eaten by the Chinese, who spit them upon wires and cook them over open fires. The Kelp Crabs are used by the natives of the Northwest coast. A large "Red Rock Crab" (*Echidnoceros setimanus*), living about the Farallone Islands, off San Francisco, is occasionally brought to the markets of that city as a curiosity, and sometimes brings as high a price as $10 each. Species of *Chionecetes* and *Lithodes* are eaten by the natives of Alaska.

LOBSTER.

The Lobster is by far the most important crustacean occurring upon the coasts of the United States, and gives rise to an extremely valuable fishery. It is confined to the Atlantic side of the continent, and ranges from Delaware, in the south, to Labrador, in the north. The most southern fishery is a small one in the neighborhood of Atlantic City and Long Branch, New Jersey. Lobsters were once moderately abundant in New York Bay, and were taken there for market, but the pollution of the waters of the bay by numerous factories and other causes have combined to nearly exterminate the species. At numerous places through Long Island Sound, Lobsters are sufficiently plentiful to permit of limited fisheries, which are mainly confined to supplying the local demand. Farther east, on the southern New England coast, in the region of Block Island, Montauk Point, the Elizabeth Islands, and Martha's Vineyard, they become much more abundant and afford a very

profitable fishery, extending through the spring, summer, and early fall. The entire coast line of Massachusetts abounds in Lobsters, wherever the character of the bottom is suitable for them, but overfishing has nearly depleted some of the shallow water areas, which were once prolific, as at Provincetown. The sandy shores of New Hampshire furnish only a moderate supply of Lobsters. Lobsters are very much more abundant on the Maine coast than anywhere to the southward, and the yearly fishery exceeds in quantity and value those of all the other States combined. This State is, in fact, the main source of supply for all the principal markets of the United States. The fishery continues in some localities throughout the year, but is most active during the spring, summer, and fall, and especially from April 1 to August 1, when the canneries are open.

The Lobster fishery, as a distinct industry, commenced on the Massachusetts coast about the beginning of the present century, and on the Maine coast about 1840. It has rapidly developed to the present time. At first, Lobsters were frequently found, during the summer, in some favorable localities at or near low-water mark, especially on the Maine coast, where they could be gaffed out from under the protection of overhanging rocks and seaweeds. They rarely occur in such situations now, and the fishery is mainly carried on in depths of a few fathoms to 20 or 30 fathoms, but sometimes in depths of 40 to 60 fathoms. On the coast of Nova Scotia, Lobsters are about as common as on the Maine coast, but farther to the north they become less abundant again. They have been taken on some of the outlying fishing banks, such as George's Bank, but are not fished for at any great distance from land.

The Lobster fishery is regularly carried on by means of wooden framework traps, or pots, generally constructed of common house-laths. They are usually made semi-cylindrical in shape, being flat below, rounded at the sides and above, and with a net-work or wooden funnel-entrance at each end, or at one end only. The ordinary size is four feet long, and about 18 inches broad and high, with two funnels; smaller sizes with one funnel, and larger sizes with four funnels are occasionally used, as are also rectangular-shaped pots. The old style of Lobster pot, employed when Lobsters were more abundant and the fishery less important, consisted of a wooden or iron hoop, of variable size, up to 4 feet or more in diameter, carrying a net, which sagged but little, and furnished above with a cross-hoop arrangement, or with twine leaders, to which the line for lowering it, as well as the bait, was fastened. This style of pot has now almost entirely disappeared from the coast, as it required constant attention, and only a few could be tended by each fisherman. The lath or cylinder pots are baited in the center with cheap or refuse fish, which are fastened on an upright, spearlike holder. They are weighted with stones, and lowered and raised by means of a rope attached to the end of the pot. The number of pots used by each fisherman varies in different localities, ranging all the way from 8 or 10 to 100. The average

number may be said to be about 50 or 60. The pots are set either singly or attached together in trawls, the character of the bottom, abundance of Lobsters, and custom regulating this matter. When set trawl-fashion, the pots can be handled much more easily than otherwise, and this method is generally preferred on the coast of Maine, wherever Lobsters are abundant and the bottom not too rough. The pots are fastened together in strings of 10 or a dozen to 50 or 60, at distances apart of 15 to 20 fathoms, and have a long buoy line at each end. The fisherman pays out his Lobster trawl in a straight line, beginning at one end, and marks the ends with kegs or small wooden buoys. After remaining down a sufficient length of time, generally twenty-four hours, he proceeds to examine his pots, beginning at one end of the trawl and underrunning it to the other. The general arrangement of the trawl is not, therefore, disturbed; but the pots, after they have been examined, fall back again into nearly the same places which they previously occupied. In setting the pots singly, each has its separate buoy line and buoy, and the fisherman passes in succession from one to the other. Where Lobsters are much scattered, this is the preferable way of setting the pots, as they are shifted slightly every time they are hauled, and are supposed thereby to fish much better. The latter method is probably the one most universally employed along the entire coast. It is customary to visit the pots early every morning, or, otherwise, when the tide serves best.

The boats used in the Lobster fishery vary in style on different parts of the coast, and generally correspond with those employed in the other fisheries of the same region. The fishing boats are usually small sail-boats, sloop or cat rigged, and ranging in length from 12 to 30 feet; but row-boats, and especially dories, are very commonly used on the shore grounds. The larger boats usually have compartments at the sides for the stowage of the Lobsters as they are taken from the traps. The fishermen attain considerable dexterity in managing their sail-boats, being able to run up to a pot, haul it, and fill away again without lowering sail. There is also a larger class of boats employed in the Lobster fishery, which act as carriers from the Lobster grounds to the larger markets, such as Portland, Boston, and New York. These are a remnant of the old fleet of well smacks, which were formerly in general use before the practice of icing fish came into vogue. In 1880, there were thirty-six well smacks employed in the Lobster trade; they ranged in size from 10 to 45 tons. In addition, there were also sixty-six registered dry smacks above 5 tons measurement, acting both as fishermen and carriers. The canneries are generally supplied by dry smacks, and the larger fresh markets by well smacks or railroad, large quantities of Lobsters being now carried long distances alive, packed in barrels. The fishermen are mostly provided with small floating Lobster cars, consisting of a rectangular wooden box or old leaky boat, permitting of the free entrance of water, in which the Lobsters are kept until a

sufficient quantity has accumulated to sell to the smacks or carry to market.

Lobsters are extensively used as bait on some parts of the coast.

The principal Lobster markets of the country are Portland, Boston, and New York. Three-fourths of all the Lobsters disposed of to the fresh trade are carried by well smacks or railroad to one or other of these three centers, where they are sold locally or distributed through the country, either alive or boiled, but generally in the former state. The dealers have large cars, in which a considerable stock can be stored awaiting orders. Lobsters are in season during the entire year, but are much more abundant in the markets and much more highly prized as food during the late spring, summer, and early fall. For most Lobster fishermen the season is of short duration, lasting only about two, three, or four months, after which time, and until the next season, they engage in other fisheries, or in farming, mining, or other pursuits. Their season's stock seldom exceeds a few hundred dollars.

The canning of Lobsters in the United States is entirely confined to the coast of Maine; and most of the Provincial canneries are controlled by American capital. Without its canning interests, the Maine Lobster fishery would lose much of its prestige, as the majority of the Lobsters canned are below the regulation size established by custom for the fresh markets. The market-smacks will seldom buy Lobsters measuring less than 10 or 10½ inches in length, and those under this size are sold to the canneries. The canning industry was first started about 1840, at Eastport, Maine, but several years elapsed before it was successfully introduced. In 1880, there were twenty-three canneries in Maine, with a total capital of $289,000, remaining open from about April 1 to August 1, and giving employment to about 650 factory hands and 2,000 fishermen. The quantity of fresh Lobsters used amounted to about 9,500,000 pounds, valued at $95,000 to the fishermen. The value of the canned products was $238,000, an enhancement in value by the process of canning of $143,000. Seventeen Provincial canneries are owned by Americans, as follows: One each in Newfoundland, the Magdalen Islands, and Prince Edward Island, three in New Brunswick, and eleven in Nova Scotia. The total amount of capital invested in 1880 was $213,000; 10,000,000 pounds of fresh Lobsters were consumed that year, and the value of the canned products was $246,000. These products are all exported to Europe and other foreign countries, none passing into the United States.

The total catch of Lobsters on the Maine coast for 1880 amounted to 14,234,000 pounds, valued at $268,000, first cost, or fishermen's prices. The catch for Massachusetts was 4,315,000 pounds, valued at $158,000, and that of the entire coast of the several Lobster States was 20,128,000 pounds, worth $483,000, first price. The quantity of Lobsters handled by the several large fresh markets during 1880 was as follows: Portland, 2,000,000 pounds; Boston, 3,637,000 pounds; New York, 2,500,000

pounds; a total of 8,137,000 pounds. The enhancement in value of these Lobsters in passing through the large markets was $105,000, making the total value of the Lobster products, as they entered the hands of the smaller wholesale and the retail dealers, $732,000. The prices received by the fishermen for Lobsters vary greatly, according to their size and the season. Canning Lobsters, which average about one pound each, bring about one cent per pound, but those above 10 inches in length are worth from 4 to 7 cents each.

Legislation relative to the Lobster fishery is entirely under the control of the several interested States, all of which, excepting New Jersey, have passed protective laws. The Maine law is the most lax of all, permitting the capture and sale of Lobsters of any size between the 1st of April and the 1st of August, and of Lobsters above 10½ inches in length the balance of the year. The remaining State laws prohibit the taking of Lobsters at any season below a certain size (ranging from 8 to 10 inches), and make other restrictions as to a close time, &c.

The propagation of the American Lobster by artificial means has been attempted, but so far without much success. Unsuccessful attempts to transplant the same species to the California coast have also been made.

CRAY-FISH.

Although Cray-fish (*Cambarus* and *Astacus*) are very abundant in American rivers, they are not much used as food. Between thirty-five and forty species are now recognized as inhabiting the United States, but only about four species are regularly sent to market. The principal markets are New York, New Orleans, and San Francisco. New York derives its supplies from the Potomac River, at Washington, and from Milwaukee and Montreal. The Washington species is the *Cambarus affinis*, and the Milwaukee, the *C. virilis*. The Cray-fish are received from Washington in the spring, and from Milwaukee and Montreal in the summer and fall. The New Orleans species is the *C. Clarkii*, which lives in the Mississippi River.

The *Astacus nigrescens* is occasionally taken to the San Francisco markets, being found abundantly in the vicinity of that city. Cray-fish are mainly used in this country for garnishing fish dishes. The sales for 1880 did not exceed 20,000 pounds, valued at about $3,500.

ROCK LOBSTER.

The Rock Lobster, or salt-water crawfish (*Panulirus interruptus*), of the California coast, is related to the Langouste or Spiny Lobster of Europe, and is much esteemed as food. It ranges southward from Santa Barbara, and is taken for food at that place, and at Wilmington, Los Angelos, and San Diego. Large quantities are shipped annually from Santa Barbara to San Francisco. It is captured in large dip-nets, which are

baited, or in traps similar to those used for the Lobster on the east coast. The season extends through the entire year, but in the winter they leave the shallow water, and are more difficult of capture. The catch for 1880 amounted to 210,000 pounds, valued at $5,600.

SHRIMP AND PRAWNS.

At least seven species of Shrimp and Prawns enter into the fisheries of the United States. They are as follows: The Common Shrimp (*Crangon vulgaris*), the California Shrimp (*Crangon franciscorum*), the Southern Shrimp and Prawns (*Penæus setiferus* and *braziliensis*), the California Prawns (*Pandalus Danæ* and *P.* sp.), and the River Shrimp (*Palæmon Ohionis*). *Crangon vulgaris* is common to both the Atlantic and Pacific coasts, but so far as is definitely known, the two species of *Penæus* are confined to the east side of the continent, and both species of *Pandalus* to the west side. *Palæmon ohionis* occurs in the rivers of the Mississippi Valley, and of the southeastern part of the United States. Mr. W. N. Lockington records *Penæus braziliensis* doubtfully from the California coast, and states that a species of *Hippolyte* (*H. brevirostris*) occurs in small quantities in San Francisco Bay, and is frequently captured along with the two species of *Crangon*, and sold with them. Four species of Prawns (*Pandalus borealis*, *leptoceros*, *Montagui*, and *propinquus*,) abound in moderate to considerable depths of water along the eastern coast, from off Nova Scotia to off the mouth of Chesapeake Bay, and offer special inducements for a deep-water fishery, although they have never yet been taken for market. Two species of fresh-water Shrimp (*Palæmon jamaicensis* and *P. forceps*), which attain a much larger size than any of the above, inhabit the rivers of Texas, and are available as food, although apparently not so used at present.

On the coasts of the New England and Middle States, *Crangon vulgaris* is the only species of Shrimp of marketable size, which occurs in sufficient abundance near the shore to be of practical value to man. Along the eastern part of this district, and as far to the westward as Buzzard's Bay, this common Shrimp is seldom utilized, excepting as a bait by amateur fishermen. At New Bedford, Massachusetts, and Newport, Rhode Island, there is a small and irregular fishery, mainly for the supply of local markets. The most important fishery for *Crangon vulgaris*, on the Atlantic coast, is at the western end of Long Island, New York, where the season lasts from March until the middle of May, the principal market supplied being New York City. About 4,000 gallons of Shrimp were marketed from this region in 1880, but since then the trade has considerably increased. The same species of Shrimp is used as food and bait on the New Jersey coast. The fishery is mainly carried on by means of scoop-nets.

On the coast of the Southern States, the Shrimp fishery has attained considerable development in some sections. Two species of Shrimp have been definitely recognized from this region, *Penæus setiferus* and

Penæus braziliensis, the former being apparently the more abundant. These two closely related species compose the bulk of the large supplies of Shrimp or Prawns consumed in New York and the southern coast cities. They frequently occur associated together in the same localities, and, being so nearly alike in appearance, are not distinguished apart by the fishermen and dealers. *Penæus setiferus* attains a length of six or more inches, exclusive of the feelers, and may measure more than three-fourths of an inch in depth and breadth, in the front or body part. Strangely enough these useful crustaceans are known both as Shrimps and Prawns to the fishermen who take them, as well as in the markets, the distinction being made with reference to size only. According to Prof. Lewis R. Gibbes, of Charleston, South Carolina, the larger individuals of both species are termed Prawns or Sprawns, and the half-grown ones, Shrimps. The Prawns appear in shallow water generally in March, or, in very open springs, as early as the latter part of February, and remain in season for two or three months, after which the supply diminishes, and they retire for a time, apparently to spawn. Their spawning localities are not known, and Professor Gibbes adds that he has never seen an individual carrying eggs. He suggests that they may ascend the rivers to spawn. In June and the succeeding months of summer, the half-grown individuals or "Shrimps" are in season, and "for tenderness of flesh and delicacy of flavor are preferred to the Prawns." In the autumn, they disappear from the coast and move into deeper water, or farther toward the south. *Penæus braziliensis* has been found as far north as the Croton River, at Sing Sing, New York, and from that point ranges southward along the entire Atlantic and Gulf coasts of the United States. It also extends to the coast of Brazil, and has been doubtfully identified from the California coast by Mr. Lockington. *Penæus setiferus* has not been recorded from northward of Norfolk, Virginia, but its southern range corresponds with that of the other species, at least so far as the coast of the United States is concerned. Neither of these species has been found in sufficient abundance north of North Carolina, however, to warrant a fishery for them.

In Delaware, a few Shrimp are used as bait by the fishermen, but the yearly catch is comparatively small. Shrimp are very abundant on the Virginia coast, but, as in Delaware, they are taken only in small quantities for bait, or are captured incidentally in seines while hauling for fish. At Norfolk and Hampton they are occasionally eaten, and at the former place they are especially esteemed as bait for the "Rock." Wherever Shrimp are abundant on the North Carolina coast, they are frequently taken incidentally by the fishermen in their seines, but finding no market for them, they are generally thrown away. No regular fishery has been established on this coast, excepting a small one at Wilmington, where the sounds and bays abound in Shrimp and Prawns, from the last of May until November. These crustaceans inhabit the

brackish as well as the salt waters of this region. They are taken in Shrimp seines, which were introduced at this locality in 1872, and also in skim and cast nets, which have been in use for a much longer period. The Shrimp seines measure from 30 to 40 yards in length, and from 6 to 10 feet in depth, and have a half-inch mesh. The season's catch for each seine is about 500 bushels. Fishing is carried on in the daytime, but not with any precise regularity, on account of the limited demand. The Shrimp are boiled in brine, in kettles holding from 10 to 50 quarts, and are then spread out to dry. They are shipped to market in baskets.

The Shrimp fishery is one of the most important in the vicinity of Charleston, South Carolina. From March to June, the larger Prawns alone are taken, but later the smaller Shrimp replace them entirely. The fishery continues from the last of March, or first of April, until the middle of November, and is carried on mainly within 15 miles of the city, and during the two or three hours of low tide of each night. The boats return to the city before daylight, so as to supply bait to the boat fishermen, after which the Shrimp remaining are sold in small lots to men, women, and children, who vend them through the city. During the first of the season (1880), some six to eight seine-boats, with crews of about six men each, are engaged in this fishery. The catch is variable, being sometimes better in one locality and again in another; and often from 10 to 20 bushels may be the result of a night's seining by one or more boats, while the remainder will obtain only 4 or 5 bushels each. Prawns are considered to form one of the best baits for Whiting, which are in season at the same time, and for this purpose the greater part of the catch is frequently sold. The shrimpers sell the Prawns by the plateful, each containing from one to one and a half quarts, the customary price being about 50 cents per plate. The price sometimes rises to one dollar per plate, or at the rate of about two cents for each Prawn. During the first few weeks of the Prawn fishery, it is one of the most profitable of all the fisheries in this section. Early in May the Prawns become more abundant, and the seines are abandoned for cast-nets, the number of persons engaging in the fishery also increasing at the same time. During the height of the season, at least 75 cast-nets are in use, and, in June, the daily catch per boat exceeds one hundred plates.

The Prawns are replaced by the Shrimp late in June, and the latter remain near the shore until November. The number of shrimpers continues about the same as the prawn-catchers, in June, until near the close of the season; but the price soon falls to 25 cents, then to 15 cents, and finally to 10 cents per plate. The greater part of the catch is sold at home, only a few hundred bushels being shipped away annually. The Shrimp and Prawn fishery of Georgia gives employment to about 400 men during the height of the season, a large part of the catch being sent to the New York markets. The best shrimping season on the Florida coast is during September and October. Cast-nets measuring from 10 to 15 feet in diameter are preferred to the seines. Before ship-

ping, the Shrimp are washed clean, boiled about ten minutes in a very thick brine, and then allowed to steam in a covered basket or barrel, after which they are spread out and dried on a platform of boards.

The Shrimp fishery of the Gulf coast is mainly confined to Louisiana and Texas, although Shrimp may possibly occur in equal abundance in other sections. The greater part of the supplies come from Barataria Bay, Louisiana, and Matagorda and Galveston Bays, Texas. Both seines and cast-nets are used by the shrimpers, who station themselves along the shores in the shrimping region. The season extends, more or less, throughout the entire year; but fishing appears to be conducted mainly from October to April. New Orleans is an important Shrimp market, and derives the greater part of its salt-water supplies from the grassy bottoms of Barataria Bay. The River Shrimp (*Palæmon ohionis*) is taken for food in the Mississippi River, near New Orleans, in cane baskets, sunk to the bottom near the banks. Large quantities of Shrimp are canned both in New Orleans and Galveston, for shipment throughout the United States and to Europe. Over 200 persons, mainly women and girls, were employed in this industry, in 1880, the production for that year having amounted to about 310,000 one and one-half pound cans.

The Shrimp and Prawn fisheries of the Pacific coast are mainly confined to the vicinity of San Francisco and Tomales Bays, California, and are controlled almost entirely by the Chinese, who export the greater part of their catch to China. A small quantity is also shipped by them for the use of their countrymen in the Sandwich Islands. *Crangon franciscorum*, being the larger species of true Shrimp, and also generally the more abundant one, figures most conspicuously in the fishery, but *Crangon vulgaris* forms a large percentage of the quantity taken and disposed of. These two species are fished for mainly in the deeper waters (12 to 20 fathoms), near shore, of the two bays above mentioned. The two species of *Pandalus* (*P. Danæ*, and *P.* sp.) are found associated together, in moderate depths of water off San Francisco Bay, between Point Reyes and the Farallone Islands, and during the two years prior to 1880 were more commonly seen in the San Francisco markets than formerly.

For the capture of Shrimp and Prawns, the Chinese use a conical, bag-shaped net, about 20 to 25 feet long and 10 feet across at the larger end, which is the mouth. From this end the net tapers toward the other, where there is an opening only about a foot across, to permit of emptying the contents of the net. One side of the mouth, or larger end, is furnished with a line of weights and the other with a line of floats, to hold it open while in use. The opening at the smaller end closes by means of a "sphincter," or puckering string. The mesh of the net measures from one to one and one-fourth inches at the mouth, and gradually diminishes to about one-fourth of an inch at the smaller end. The Shrimp are first carried fresh to the city market, and those remain-

ing unsold at the close of the day are carried back to the Chinese settlement, and put at once into boiling brine, from which, after sufficient boiling, they are taken out and spread to dry upon level plats of hard ground, which have been previously stripped of grass and rendered perfectly smooth. After four or five days' time, they are crushed under large wooden pestles, or trod upon by the Chinese in wooden shoes, for the purpose of loosening the meats from the outer chitinous covering; after which the entire mixture is put through a fanning mill, for the separation of the meats from the shells. The meats are partly consumed at home, or at the various inland Chinese settlements, but are mostly shipped to China. They are worth 5 cents a pound in San Francisco. The shells are utilized as manure, to some extent, about San Francisco; but, like the meats, are mostly sent to China, where they serve as a fertilizer for rice, the tea plant, &c. In San Francisco they sell at about 25 cents per hundred-weight. Both the meats and shells are shipped to China in sacks. The trade is entirely in the hands of Chinese merchants, who ship by way of Hong-Kong.

In 1880, 4,214,000 pounds of Shrimp and Prawns, valued at $209,295, to the fishermen, were taken and sold on the coasts of the United States.

There are three common species of Mantis Shrimp (*Squilla empusa* and *dubia*, and *Coronis glabriusculus*) living upon the eastern coast of the United States, one or more of which are occasionally used as bait in the Southern States.

AMPHIPODS AND ISOPODS.

There are numerous species of Amphipods occurring upon the American coasts, which act as useful scavengers, both in shallow and deep water. They frequently annoy fishermen by eating the fish caught on trawl-lines. There is also one very injurious species of Amphipod (*Chelura terebrans*), and one of Isopod (*Limnoria lignorum*), which are active wood borers, rapidly destroying submerged timbers, such as the piles of wharves, buoys, &c. They sometimes act in concert, and the results are similar to those attained by the ship-worm (*Teredo*). Numerous instances of their ravages have been recorded. The *Limnoria* inhabits the Pacific as well as the Atlantic coast, but the *Chelura* has so far been recognized only from New England. They are both European species.

KING CRAB—HORSESHOE CRAB.

The curious Horseshoe Crab or King Crab (*Limulus Polyphemus*), which ranges along nearly the entire eastern coast of the United States, is occasionally eaten by man, but its flavor is not of a high order, and there is a general prejudice against it as an article of food It is, however, frequently fed to swine and poultry on the coast of the Middle and Southern States, and in the same regions is in great favor as a fertil-

izer for crops. It forms an excellent bait for eels, and is fed to them regularly when kept in confinement. In Southern New Jersey and Delaware, there are several factories for the grinding of King Crabs for fertilizing purposes, and there and elsewhere the farmers also prepare them for their own use. They are captured during May and June, when the females, accompanied by the males, ascend the beaches, in immense numbers, to spawn. They are picked up in the hands or with pitchforks, deposited in large piles to dry for one or two months, and then broken up and ground. The product is termed concerine, and is used alone or composted with muck, lime, &c. It is extensively employed by the fruit-growers of New Jersey, Delaware, and Maryland, and is also applied to general crops.

WORMS.

Several species of marine annelids are occasionally employed by fishermen as bait, but mainly by amateurs. These animals give rise to no industry, but are generally obtained by those who desire them for their own purposes. The commoner shore species are the ones employed, and include, among others, *Arenicola marina*, the several species of *Nereis*, *Diopatra cuprea*, *Clymenella torquata*, &c. The common Earth Worm (*Lumbricus terrestris*, L.) is also occasionally used as bait in the fresh waters. Some of the Western Indian tribes use a species of fresh-water annelid (*Ephydra* Sp.) as food. It is prepared dry for keeping.

MEDICINAL LEECH.—The American medicinal Leech (*Macrobdella decora*) is quite widely distributed through the Northeastern part of the United States, and was formerly extensively employed by physicians. In recent times, the practice of leeching has greatly declined. Prior to 1839, there was no regular importation of foreign Leeches into this country, and physicians were obliged to depend almost entirely on the American species, which, for most purposes, is inferior to the European, having less power of attaching itself. This very weakness, however, renders it preferable for many cases, where it is desirable to distribute the blood-letting over a greater surface than would be acted upon by a single European Leech. In 1839, the first importing house for European Leeches was established in New York, and from that time until about 1856 the sale of Leeches rapidly increased, over 800,000, valued at $90 per thousand, having been imported the latter year. Since 1856, the use of Leeches, and, as a consequence, the quantity imported, has gradually diminished from year to year, until, in 1880, the import trade was only one-seventh in value that of the former year. The prices have also declined to from $25 to $50 per one thousand, according to quality. While the American Leech has been collected for medicinal purposes in various localities where it occurs, the main source of supply has always been the eastern part of Pennsylvania, and especially Bucks and Berks counties. Between 1840 and 1850, more

American than foreign Leeches were used in Philadelphia, the market price at that time having been about $10 per thousand. Now, scarcely more than 1,000 are used there annually. The quantities sold in other cities are so small that we have been unable to obtain figures regarding them. The use of Leeches is again being revived in Philadelphia. Several unsuccessful attempts at breeding both the American and European Leeches have been tried in this country.

ECHINODERMS.

HOLOTHURIANS.—At least three species of edible Holothurians or Sea-cucumbers occur upon the Eastern coast of the United States. They are: *Pentacta frondosa*, ranging northward from New York; and *Holothuria floridana* and *princeps*, belonging to the Southern States. Although the *Pentacta frondosa*, according to the late Dr. William Stimpson, is of good flavor, it has never been used as food. One or both of the Southern species, however, gave rise, in 1871, to a limited industry, which was abandoned after two years' time. The Holothurians were collected from the shallow waters of the reefs about Key West, Florida, boiled, cleaned and dried, after the manner of trepang, and shipped to China. Material was abundant and easily obtained at low prices, boys principally being employed to collect it at a certain price by the piece. This industry was confined to the winter season.

SEA URCHINS.—Two species of edible Sea Urchin, related to the edible Sea Urchin of Southern Europe, live upon our coasts. *Strongylocentrotus dröbachiensis*, also European, ranges northward from New Jersey on the east coast, and also occurs in Alaska. *S. franciscanus* inhabits the west coast, from Southern Alaska to San Diego, California. *S. dröbachiensis* was formerly eaten by the native east coast Indians, and is now extensively used as food by some of the Alaskan tribes. *S. franciscanus* is also said to be eaten to some extent; it attains a much larger size than the former species. A third species of Sea Urchin, the so-called 'Sand Dollar,' (*Echinarachnius parma*), inhabits the east coast, and is frequently utilized by the fishermen for making an indelible ink.

STAR-FISH.—The two commoner species of Star-fish of the east coast (*Asterias vulgaris* and *Forbesii*), infest the oyster beds and occasion much destruction, frequently rendering certain sections entirely unfit for oyster culture. *A. vulgaris* ranges northward from New York, and *A. Forbesii* southward from Massachusetts, so that they overlap in their distribution and form a continuous line. The two species are closely related and are not distinguished apart by the fishermen. Their manner of attacking the oyster has never been satisfactorily made out, but Mr. Ernest Ingersoll supposes that they first break off the thin and newly formed edge of the shell, by means of the muscular ring at the entrance to the stomach. Although sluggish in their movements, and while occurring on the oyster beds at nearly all times, they frequently appear

suddenly in immense hordes, and, without warning, destroy thousands of dollars' worth of oysters. The greatest destruction occurs in the latter part of summer and the fall, after the spawning season of the Star-fish. Dredges, beam-trawls, and tangles have been employed to rid the beds of these pests, and in many places large sums are expended annually in keeping the beds free from this most dreaded enemy.

SPONGES.

The American Sponge fishery is now a well-established industry of considerable importance, and gives employment to a large fishing fleet. Prof. Alpheus Hyatt, one of the most recent writers on American Sponges, regards most of the American commercial forms as identical specifically with the Mediterranean, but separates them on subspecific differences. His classification has been adopted in this catalogue. The same subspecies belong to both Florida and the Bahama Islands, but fewer commercial grades are recognized from the former than from the latter region. The American species and subspecies are as follows: *Spongia officinalis* Linn., subsp. *tubulifera*—Glove Sponge; *S. graminea* Hyatt—Glove Sponge; *S. equina* Sch., subsp. *gossypina*—Sheepswool Sponge; *S. equina*, subsp, *meandriniformis*—Velvet Sponge; *S. equina*, subsp. *cerebriformis*—Grass Sponge; *S. agaricina*, subsp. *corlosia*, *dura*, *punctata*—Yellow Sponge. The finest quality of American Sponge is the Sheepswool, the remaining grades being all quite inferior to it. The Florida Sheepswool Sponges now command a higher price than those from the Bahamas.

The Florida Sponge grounds form three separate elongate stretches, along the southern and western coasts of the State. The first includes nearly all of the Florida Keys; the second extends from Anclote Keys to Cedar Keys; and the third from just north of Cedar Keys to Saint Mark's, in Apalachee Bay. The linear extent of these grounds is about 120 miles, and their breadth varies from a few miles to 15 or 20 miles. The total area of the Sponge grounds worked in 1880 was reckoned at about 3,000 square geographical miles, but this does not by any means cover the possibilities of the coast, as many additional sponging areas have been discovered since then. Key West is the principal headquarters for the Sponge fleet. The Florida Sponge fishery differs from the Mediterranean in that no divers are employed. The Sponge fleet consists of over 100 vessels, ranging in size from 5 to 50 tons burden. These vessels are mostly of light draft, and schooner rigged, and have proportionately large decks and holds for the storage of working gear and Sponges. They are well built and fast sailers. The crews number from five to fifteen men each, one acting as cook and remaining on the vessel, while the remainder go in search of Sponges, in couples, in small, light yawl boats called dingies. The sponger's outfit consists of a three-pronged iron hook or spear, mounted on a long pole, and a water-glass,

which is made by inserting a piece of window-glass across the end of a small wooden box or bottomless pail. The latter contrivance enables the sponger to examine the bottom, when the surface is more or less rough. Of the two men in each dingy, one stands at the stern and paddles slowly, while the other kneels down amidships or at the bow, and watches the bottom. As soon as a Sponge is sighted, the boat is quickly stopped, and the "hooker" thrusts down his spear and fastens into it; doing this with ease, even in depths of 30 to 35 feet. Great dexterity is required in this performance. Collecting goes on at all seasons when the weather will permit. At noon and sunset, the spongers return to the vessels and spread their catches upon the decks, where the slime from the Sponges runs off freely. Every Friday night the vessels carry their week's catch to some place on the neighboring shore, where they have one or more inclosures called crawls, 8 or 10 feet square, and situated in depths of about 2 or 3 feet of water. Saturdays are spent in depositing the past week's catch, to soak, and in cleaning that of the week before, which is done by squeezing the Sponges and beating them with a short heavy stick, called a "bruiser." After cleaning, they are strung on rope yarns, about 6 feet long, suspended from the rigging to dry, and afterwards packed in the hold.

The cruises last from four to eight weeks, at the end of which time the vessels return to Key West, a few only going to Apalachicola. The Sponges are piled on a wharf, each variety or grade by itself, and are sold to agents who first inspect and then submit a written bid, sales being made, of course, to the highest bidder. The different grades are sold in a lump, and not by weight or count, the agent being able to estimate the quantity very closely from long experience. The process of bleaching or liming Sponges has been extensively in vogue at Key West, but it is now meeting with much discouragement from the trade, for while it renders the Sponge much lighter in color, it also partly destroys its fiber and makes it less tough and durable. The Sponges are stored in large airy warehouses by the agents, until a sufficient quantity has been obtained to pay for shipping. After a thorough drying, and bleaching, if desired, the Sponges are pounded to rid them of sand, trimmed, sorted, and packed, by means of hydraulic pressure, in bales measuring about 30 by 18 by 18 inches. They are then ready for shipping. The Florida Sponges are all shipped from Key West and Apalachicola to New York, which is the only market for American Sponges, and where they are disposed of to the trade. There are about six wholesale houses in New York for the purchase and sale of Florida Sponges. The value of the Florida Sponge fishery to the fishermen averages about $200,000 annually.

The Florida Sponge fishery originated about 1852, for, although the occurrence of Sponges on the Florida reefs was previously made known, the species were not supposed to be of commercial value. The industry has gradually developed to the present time, but during the past few

years has remained at about the same standing. The demand for the better grades greatly exceeds the supply. Fully 75 per cent. in value of all the Florida Sponges marketed are of the Sheepswool variety.

Sponge culture has recently attracted the attention of those interested in the Florida Sponge fishery, since some of the older grounds have shown signs of becoming exhausted. The recent successful attempts at raising Sponges from clippings in the Mediterranean have inspired hopes that similar practices might succeed well here, and the first trials have been quite encouraging. In the present exhibit are included four specimens of Sheepswool Sponges, grown from small cuttings at Key West, but not, however, under the most favorable conditions. They are numbered as follows: 771, 772, 773, 774. They were all planted December 8, 1881, in a depth of 2½ feet of water, and represent six months' growth, from an original height of 2½ inches. The smallest specimen was planted in a small cove or bight, where there was little or no tidal current, and hence its slight increase in size. The other three specimens were placed in a tide-way, two being attached by wires and the third by means of a stick running through it. The agent of Messrs. McKesson & Robbins, who made these experiments, states that it requires at least four months for the Sponge to recover from the injury done it in the cutting, which removes the outer skin along the edges of the section. At the end of the first four months no apparent increase in size had taken place, so that the growth exhibited is for two months only. Two hundred and sixteen specimens in all were planted by the same party at the above date, and at last accounts they were doing nicely. The greatest difficulty in the way of Sponge culture about Key West, at present, arises from the fact that the spongers are permitted to fish everywhere without restriction, and it is impossible to select a suitable spot without fear of its being molested. The agent claims that with a grant, protecting a good tidal area of suitable depth and dimensions, he can make Sponge culture a complete success.

Boring Sponge.—The Boring Sponge (*Cliona sulphurea*) has the power of excavating in limy structures, such as the shells of mollusks, submerged marble, &c. It begins its life as a burrower, as frequently into living as dead shells, and is at times a source of considerable irritation to oysters and other shell fish, but probably does not cause much destruction. In 1878, a cargo of Italian marble, which had been wrecked in 1871 off Long Island, was taken up, and the blocks of stone were seen to be thoroughly penetrated, to a depth of one or two inches, by the crooked and irregular borings of this Sponge. Beyond the borings the marble was still in good condition.

LIST OF THE SPECIES OF ECONOMIC CRUSTACEANS, WORMS, ECHINODERMS, AND SPONGES EXHIBITED.

CRUSTACEANS.

Gelasimus minax, Le Conte. Fiddler Crab. Atlantic coast of the United States, south of Cape Cod. Used as bait.

4909. Newport, Rhode Island. U. S. Fish Commission.

Gelasimus pugnax, Smith. Fiddler Crab. Atlantic coast of the United States, south of Cape Cod. Used as bait.

3623. Newport, Rhode Island. U. S. Fish Commission.

Gelasimus pugilator, Latreille. Fiddler Crab. Atlantic coast of the United States, south of Cape Cod. Used as bait.

4895. Wood's Holl, Massachusetts. U. S. Fish Commission.

Heterograpsus nudus, Stimpson. Purple Shore Crab. Pacific coast, United States, Puget Sound to Southern California.

2056. Monterey, California. Trowbridge.

Pinnotheres ostreum, Say. Oyster Crab. Atlantic coast, Massachusetts to South Carolina; living as a messmate in the shells of the oyster, *Ostrea virginiana*. Used as food.

2542. New York Bay. E. G. Blackford.

Cancer irroratus, Say. Rock Crab; Jonah Crab. Atlantic coast, Labrador to South Carolina. Used as food and bait.

4896. Vineyard Sound, Massachusetts. U. S. Fish Commission.

4897. Vineyard Sound, Massachusetts. U. S. Fish Commission.

Cancer borealis, Stimpson. Rock Crab; Jonah Crab. Atlantic coast, Nova Scotia to Long Island, New York. Used as food.

4596. Off Newport, Rhode Island. U. S. Fish Commission.

4899. Off Newport, Rhode Island. U. S. Fish Commission.

Cancer magister, Dana. Common Crab. Pacific coast, Alaska to Lower California; shallow water, near the shore. Used as food.

2553. California. William Stimpson.

5037. San Francisco, California. R. E. C. Stearns.

Cancer antennarius, Stimpson. Rock Crab. Pacific coast, Queen Charlotte's Island to Lower California; shallow water, near the shore. Used as food.

2033. California. William Stimpson.

Cancer productus, Randall. Red Crab. Pacific coast, Queen Charlotte's Island to Lower California; shallow water, near the shore. Used as food.

2529. San Francisco Bay, California. H. Hemphill.

Panopeus Herbstii, Edwards. Mud Crab. Atlantic coast, Cape Cod to Brazil; shore. Used as food and bait.

4539. Newport, Rhode Island. U. S. Fish Commission.

Panopeus depressus, Smith. Mud Crab. Atlantic coast, Cape Cod to Florida; shore. Used as bait.

2292. Garden Key, Florida.

Menippe mercenarius, Gibbes. Stone Crab. Atlantic coast, North Carolina to Key West; Gulf of Mexico; shallow water. Used as food.

4906. Charleston Harbor, South Carolina. R. E. Earll.

Carcinus mænas, Leach. Green Crab. Atlantic coast, Cape Cod to New Jersey; between tides. Used as bait.

4901. Wood's Holl, Massachusetts. U. S. Fish Commission.

Platyonichus ocellatus, Latreille. Lady Crab; Sand Crab. Atlantic coast, Cape Cod to Florida; Gulf of Mexico; shallow water, near the shore, and between tides. Used as food and bait.

4894. Wood's Holl, Massachusetts. U. S. Fish Commission.

Callinectes hastatus, Ordway. Blue Crab; Edible Crab. Atlantic coast, Cape Cod to Florida; Gulf of Mexico; shallow water, near the shore, and between tides. Used as food and bait.

3904. New York market. E. G. Blackford.

4946. Wood's Holl, Massachusetts. U. S. Fish Commission.

4977. Chesapeake Bay, through Washington market. Mounted by F. A. Lucas.

Libinia emarginata, Leach. Spider Crab. Atlantic coast, Maine to Florida. Used as bait.

4902. Newport, Rhode Island. U. S. Fish Commission.

Libinia dubia, Edwards. Spider Crab. Atlantic coast, Massachusetts to the West Indies. Used as bait.

4898. Wood's Holl, Massachusetts. U. S. Fish Commission.

4905. Wood's Holl, Massachusetts. U. S. Fish Commission.

Epialtus productus, Randall. Kelp Crab. Pacific coast; California and Oregon. Used as food by the natives.

2139. Pacific coast. Dr. Suckley.

Hippa talpoida, Say. Sand-bug; Bait-bug. Atlantic coast, Cape Cod to Florida; between tides. Used as bait.

4719. Wood's Holl, Massachusetts. U. S. Fish Commission.

Eupagurus pollicaris, Stimp. Hermit Crab. Atlantic coast, Massachusetts to Florida. Available as bait.

3902. New Haven, Connecticut, on oyster beds. U. S. Fish Commission.

Eupagurus bernhardus, Brandt. Hermit Crab. Atlantic coast, from Vineyard Sound northward. Available as bait.

2849. Gloucester Harbor, Massachusetts. U. S. Fish Commission.

Eupagurus longicarpus, Stimpson. Hermit Crab. Atlantic coast, Massachusetts Bay to South Carolina. Available as bait.

3339. Buzzard's Bay, Massachusetts; 7 fathoms. U. S. Fish Commission.

Panulirus interruptus, Randall. Rock-lobster; Spiny-lobster; Salt-water Crayfish. Pacific coast, Point Conception, California, southward. Used as food.

4907. Santa Barbara, California. D. S. Jordan.

5038. San Francisco market, California. R. E. C. Stearns.

Homarus americanus, Edwards. American Lobster. Atlantic coast, Labrador to Delaware. Used as food and bait.

4908. Newport, Rhode Island. U. S. Fish Commission.

4976. New Jersey coast. E. G. Blackford. Weight when alive, 18 pounds. Mounted by F. A. Lucas.

4978. New England coast, through Washington market. Weight when alive, 3 pounds. Mounted by F. A. Lucas.

4981. Coast of Maine, through Boston market. Johnson & Young. Average size of the lobsters now received at the Boston market.

Cambarus affinis, Erichson. Crayfish. Middle States, Maryland, Virginia, District of Columbia. Used as food.

4904. Havre de Grace, Maryland. T. H. Bean.

4893. Potomac River, Gunston, Virginia. M. McDonald.

Cambarus virilis, Hagen. Crayfish. British America, Mississippi Valley, Texas. Used as food.

4900. Milwaukee, Wisconsin E. G. Blackford.

Cambarus Clarkii, Girard. Crayfish. Louisiana, Texas. Used as food.

3359. Mississippi River, near New Orleans, Louisiana G. Dunbar's Sons.

Astacus nigrescens, Stimpson. Crayfish. California. Used as food.

4974. San Francisco, California. Mus. Comp. Zoology.

Crangon vulgaris, Fabricius. Common Shrimp. Atlantic coast, Labrador to North Carolina; Pacific coast, California. Used as food and bait.

4891. Chesapeake Bay. U. S. Fish Commission.

Crangon franciscorum, Stimpson. California Shrimp. Pacific coast, Puget Sound to Point Conception, California. Used as food.

2284. San Francisco, California. H. Hemphill.

Hippolyte brevirostris, Dana. Shrimp. Pacific coast, Straits of Fuca to San Francisco Bay. Used as food.

2283. San Francisco, California. H. Hemphill.

Palæmonetes vulgaris, Stimpson. Common Prawn. Atlantic coast, Massachusetts Bay to Florida.

2252. Vineyard Sound, Massachusetts. U. S. Fish Commission.

Palæmon ohionis, Smith. River Shrimp. Mississippi River and its tributaries. Used as food.

2264. Mississippi River, New Orleans, Louisiana. G. Kohn.

Palæmon jamaicensis, Olivier. Rivers of Texas. Available as food.

2064. Brownsville, Texas.

2165. Texas.

Palæmon forceps, Edwards. Rivers of Texas. Available as food.

2063. Brownsville, Texas.

Pandalus borealis, Kröyer. Deep-water Prawn. Northeastern coast of the United States; 40 to 160 fathoms. Available as food.

4550. Thirty miles off Cape Sable, Nova Scotia; 90 fathoms. U. S. Fish Commission.

Pandalus leptoceros, Smith. Deep-water Prawn. Northeastern coast of the United States; 15 to 430 fathoms. Available as food.

4728. Off Martha's Vineyard, Massachusetts; 186–194 fathoms. U. S. Fish Commission.

Pandalus Montagui, Leach. Deep-water Prawn. Northeastern coast of the United States; 15 to 116 fathoms. Available as food.

3946. Off Cape Cod, Massachusetts; 70 fathoms. U. S. Fish Commission.

Pandalus propinquus, G. O. Sars. Deep-water Prawn. Northeast coast of the United States; 116 to 365 fathoms. Available as food.

4890. Off Delaware Bay; 312 fathoms. U. S. Fish Commission.

4796. Off Delaware Bay. U. S. Fish Commission.

Penæus setiferus, Edwards. Southern Shrimp or Prawn. Atlantic coast, Virginia to Florida; Gulf of Mexico. Used as food.

2074. Charleston, South Carolina.

Squilla empusa, Say. Mantis Shrimp. Atlantic coast, Cape Cod to Florida. Used as bait.

4118. Stonington, Connecticut. F. G. Niles.

4548. Off Newport, Rhode Island. U. S. Fish Commission.

Squilla dubia, Edwards. Mantis Shrimp. Atlantic coast, Southern States. Used as bait.

2057. Savannah, Georgia. R. J. Nunn.

Coronis glabriusculus, Stimpson. Mantis Shrimp. Atlantic coast, Southern States. Used as bait.

2052. Garden Key, Tortugas, Florida. Dr. Whitehurst.

Gammarus locusta, Gould. Scud. Atlantic coast, New Jersey to Greenland. Scavengers.

2601. Cape Ann, Massachusetts. U. S. Fish Commission.

Orchestia agilis, Smith. Sand-flea. Atlantic coast, Bay of Fundy to New Jersey. Scavengers.

4892. Newport, Rhode Island. U. S. Fish Commission.

Limnoria lignorum, White. Gribble; Boring Limnoria. Atlantic coast, Gulf of Saint Lawrence to Florida; Pacific coast, California. Destructive to submerged structures of wood.

4903. Casco Bay, Maine. Specimens in alcohol. U. S. Fish Commission.

2290. Wood's Holl, Massachusetts. Wood showing ravages. V. N. Edwards.

2221. San Diego, California. Wood showing ravages. H. Hemphill.

2240. Eastport, Maine. Wood showing ravages. U. S. Fish Commission.

4981. New England coast. Wood showing ravages. U. S. Fish Commission.

Limulus Polyphemus, Latreille. King Crab; Horseshoe Crab. Atlantic coast, Casco Bay, Maine, to Gulf of Mexico. Used as food for swine and poultry, and as a fertilizer.

3385. Wood's Holl, Massachusetts. U. S. Fish Commission.

4979. New Haven, Connecticut. U. S. Fish Commission.

4980. New Haven, Connecticut. U. S. Fish Commission.

WORMS.

Lepidonotus squamatus, Leach. Scaly Worm. Atlantic coast, New Jersey to the Arctic Ocean. Used as bait.

217. Eastport, Maine. H. E. Webster.

Nephthys discors, Ehlers. Atlantic coast. Used as bait.

216. Eastport, Maine. H. E. Webster.

Nereis virens, Sars. Clam Worm; He Clams; Bait Worm. Atlantic coast, Labrador to Connecticut. Used as bait.

208. Naushon, Massachusetts. U. S. Fish Commission.

220. Eastern Coast, United States. H. E. Webster.

Nereis limbata, Ehlers. Atlantic coast, Massachusetts Bay to South Carolina. Used as bait.

218. Great Egg Harbor, New Jersey. H. E. Webster.

Nereis irritabilis, Webster. Atlantic coast. Used as bait.

212. Coast of Virginia. H. E. Webster.

Diopatra cuprea, Claparède Bait Worm. Atlantic coast, Massachusetts to South Carolina. Used as bait.

207. Naushon, Massachusetts. U. S. Fish Commission.

222. Coast of Virginia. H. E. Webster.

Marphysa sanguinea, Quat. Atlantic coast. Used as bait.

213. Coast of Virginia- H. E. Webster.

Arabella opalina, Verrill. Atlantic coast. Used as bait.

214. Provincetown, Massachusetts. H. E. Webster.

Rhynchobolus dibranchiatus, Verrill. Atlantic coast, Massachusetts Bay to New Jersey. Used as bait.

221. Provincetown, Massachusetts. H. E. Webster.

Arenicola marina, Linné. Atlantic coast, Massachusetts Bay, southward. Used as bait.

219. Provincetown, Massachusetts. H. E. Webster.

Arenicola cristata, Stimpson. Atlantic coast, Southern States. Used as bait.

211. Florida. H. E. Webster.

Clymenella torquata, Verrill. Atlantic coast, Bay of Fundy to New Jersey. Used as bait.

206. Naushon, Massachusetts. U. S. Fish Commission.

Amphitrite brunnea, Stimpson. Atlantic coast. Used as bait.

215. Eastport, Maine. H. E. Webster.

Macrobdella decora, Verrill. American Medicinal Leech. Northeastern United States. Used in drawing blood.

209. New Haven, Connecticut. A. E. Verrill.

Echinoderms.

Pentacta frondosa, Jæger. Sea Cucumber. Atlantic coast, New England States northward. Available as food.

5091. Eastport, Maine. U. S. Fish Commission.

Strongylocentrotus dröbachiensis, A. Agassiz. Common Sea Urchin; Sea Egg. Atlantic coast, New Jersey to the Arctic Ocean; Alaska. Used as food.

5687. Off Newport, Rhode Island. U. S. Fish Commission.

Strongylocentrotus franciscanus, A. Agassiz. Sea Urchin. Pacific Coast, Southern Alaska to Southern California. Used as food.

5690. Sitka, Alaska. F. Bishoff.

Echinarachnius parma, Gray. Sand Dollar. East coast, New Jersey to Labrador. Used for making ink.

5689. Cape Cod Bay, Massachusetts. U. S. Fish Commission.

Asterias vulgaris, Stimpson. Starfish. Atlantic coast, Labrador to New York. Destructive to oyster beds.

5024. Eastport, Maine. U. S. Fish Commission.*

Asterias Forbesii, Stimpson. Starfish. Atlantic coast, Massachusetts to the Gulf of Mexico. Destructive to oyster beds.

5688. Wood's Holl, Massachusetts. U. S. Fish Commission.*

SPONGES.

COMMERCIAL SPECIES.

Collection of Florida Commercial Sponges, donated to the United States National Museum by McKesson & Robbins, druggists and importers, New York, 1882.†

Spongia graminea, Hyatt. Glove Sponge. Distribution—Florida.

822. Sal Bunches Sound; depth, 4 feet.

825. Sugar Loaf Sound; depth, 3 feet.

943. Cudjoe's Key Sound; depth, 6 feet; two to eight months old; 16 specimens.

---

* For reference to other specimens, illustrating the method of attacking oysters, etc., see section of Mollusca.

† Unless otherwise stated, each number in this list indicates a single specimen of sponge.

Spongia equina, Schm.; subspecies *gossypina*, D. et M. Sheepswool Sponge. Distribution—Florida, Bahamas, Cuba, Mexico.

799. Var. *hirsuta*. Dead Man's Bay; depth, 24 feet.
800. Var. *hirsuta*. Off Pepper Fish Keys; depth, 18 feet.
801. Var. *hirsuta*. Off Cape Romano; depth, 20 feet.
803. Var. *hirsuta*. Off Cedar Keys; depth, 17 feet.
804. Var. *hirsuta*. Off Key Vaccas; depth, 10 feet.
808. Var. *hirsuta*. Metacombe Channel; depth, 8 feet.
785. Var. *alba*. Florida.
792. Var. *alba*. Florida.
833. Var. *alba*. North of Cedar Keys; depth, 18 feet.
806. Var. *porosa*. Off Niggerhead Key; depth, 12 feet. (Reef Sheepswool Sponge.)
811. Var. *porosa*. Off Old Rhoade's Key; depth, 10 feet.
832. Var. *porosa*. Off Cudjoe's Key; depth, 15 feet.
798. Off Rock Island; depth, 24 feet.
802. Off Grassy Keys; depth, 12 feet.
805. Off Saint Martin's Reef; depth, 10 feet.
807. Off Anclote Keys; depth, 18 feet.
809. Off Bahia Honda Key; depth, 18 feet.
810. Long Key Channel; depth, 8 feet.
812. Off Anclote Keys; depth, 12 feet. ("Rolling John.")
813. Off Saint Marks; depth, 30 feet.
816. Off Ragged Keys; depth, 10 feet. (Reef Sheepswool Sponge.)
834. Off Marquesas Island; depth, 10 feet.
836. Off Cudjoe's Key; depth, 15 feet.
917. Torch Key Channel; depth, 8 feet; eight months old; three specimens.
918. Long Key Banks; depth, 6 feet; five to eight months old (?); four specimens. ("Rolling Johns.")
919. Anclote Keys; depth, 18 feet; eight months old.
920. Bahia Honda Channel; depth, 12 feet; six to twelve months old; three specimens.
921. Metacombe Lake; depth, 8 feet; eight to twelve months old; eight specimens.
922. Soldier Key Bank; depth, 8 feet; fifteen months old (?); three specimens.
924. Caizar's Creek; depth, 8 feet; eighteen months old.
925. Dead Man's Bay; depth, 18 feet; twelve months old.
926. Marquesas Keys Channel; depth, 18 feet; eight to fifteen months old; three specimens.
927. Rock Island; depth, 26 feet; twelve months old.
928. Key Vaccas Channel; depth, 10 feet; ten to twelve months old; three specimens.
929. Saint Martin's Reef; depth, 10 feet; twelve months old.

930. Crawfish Bar, off Key West; depth, 12 feet; eight to twelve months old; three specimens.
931. Pepper Fish Key; depth, 22 feet; nine months old.
932. Boca Grande Lake; depth, 12 feet; eighteen months old (?); three specimens. ("Rolling Johns.")
933. Metacombe Channel; depth, 18 feet; six to fifteen months old; seven specimens.
934. No Name Key Channel; depth, 12 feet; six to twelve months old; three specimens.
935. Sugar Loaf Sound; depth, 5 feet; six months old; three specimens.
936. Channel Key Lake; depth, 6 feet; six months old; two specimens.
937. Biscayne Bay; depth, 10 feet; six to twelve months old; five specimens.
938. Long Key Channel; depth, 8 feet; twelve months old; three specimens.
939. Key West Channel; depth, 10 feet; twelve months old; two specimens.
940. Contents Key Channel; depth, 10 feet; eight months old; three specimens.
941. Key West Banks; depth, 8 feet; two years old (?); three specimens. ("Rolling Johns.")
942. Off Suwanee River; depth, 18 feet; eight months old.

885 to 914, inclusive. Florida; 30 specimens.

915. Off Sugar Loaf; depth, 12 feet. Dried in its natural state, without cleaning.
916. Florida. Preserved in alcohol, in their natural state. Two specimens.
923. South side of the Island of Cuba; depth, 16 feet.
771. Cultivated sponge. Key West, Florida; depth, 2½ feet. Six months' growth from cutting; original height, 2½ inches.
772. Cultivated sponge. Key West, Florida; depth, 2½ feet. Six months' growth from cutting; original height 2½ inches.
773. Cultivated sponge. Key West, Florida; depth, 2½ feet. Six months' growth from cutting; original height, 2½ inches.
774. Cultivated sponge. Key West, Florida; depth, 2½ feet. Six months' growth from cutting; original height, 2½ inches.

Spongia equina, Schm.; subspecies *meandriniformis*. Boat Sponge. Distribution—Florida, Bahamas, West Indies, Brazil.

814. Off Alligator Reef; depth, 12 feet.
831. Off Alacrans, Mexico; depth, 10 feet.

Spongia equina, Schm.; subspecies *cerebriformis*, Duch. et Mich. Grass Sponge. Distribution—Florida, Bahamas, Cuba.

842. Var. *plana*. Off Sound Point; depth, 8 feet.
841. Var. *calciformis*. Off Jacob's Harbor; depth, 10 feet.

856. Var. *calciformis*. Florida.
863. Var. *calciformis*. Florida.
815. Metacombe Sound; depth, 4 feet.
818. Off Jew Fish Bush; depth, 12 feet.
821. Off Rock Island; depth, 15 feet.
824. Couch Reef; depth, 15 feet.
826. Soldier Key Channel; depth, 12 feet.
827. Sugar Loaf Sound; depth, 3 feet.
838. Off Key Large; depth, 8 feet. (Illegitimate Grass Sponge.)
840. Off Metacombe Island; depth, 12 feet.
944. Boca Chica Sound; depth, 4 feet; three months old; five specimens.
945. Long Key Channel; depth, 8 feet; eight to fifteen months old; three specimens.
946. Metacombe Channel; depth, 8 feet; six to twelve months old; four specimens.
947. Key West Channel; depth, 8 feet; three to six months old; four specimens.
948. Sal Bunches Sound; depth, 5 feet; three to five months old; five specimens.
950. Key Vaccas Channel; depth, 12 feet; four to six months old; four specimens.
951. Sugar Loaf Sound; depth, 5 feet; six months old; three specimens.
952. Ram-rod Key Channel; depth, 10 feet; four to twelve months old; three specimens.
953. Soldier Key Bar; depth, 4 feet; young; nine specimens.
949. South side of the island of Cuba; depth, 4 feet; two specimens.

Spongia agaricina, Pall.; subspecies *corlosia*, Duch. et Mich.; *dura*, Hyatt; *punctata*, Hyatt. Yellow Sponge. Distribution—Florida, Bahamas.

852. *S. corlosia*, var. *fusca*. Florida.
857. *S. corlosia*, var. *fusca*. Apalachicola.
869. *S. corlosia*, var. *fusca*. Florida.
819. *S. dura*. Off Duck Key; depth, 15 feet.
817. *S. punctata* (?). Barnes' Sound; depth, 10 feet.
837. *S. punctata* (?). Off Pepper Fish Key; depth, 12 feet.
820. Off Saint Martin's Reef; depth, 10 feet.
823. Metacombe Channel; depth, 10 feet.
828. Off Anclote Keys; depth, 27 feet.
829. Off Rock Island; depth, 24 feet.
830. Long Key Channel; depth, 8 feet.
835. Off Cedar Keys; depth, 12 feet.
839. Barnett Sound; depth, 8 feet.
843. Off Marquesas Keys; depth, 18 feet.

844. Biscayne Bay; depth, 13 feet.
954. No Name Key Channel; depth, 12 feet; four to six months old; four specimens.
955. Crawfish Bar, off Key West; depth, 10 feet; six months old; four specimens.
956. Anclote Keys; depth, 18 feet; six months old.
957. Key West Channels; depth, 8 feet; six to eight months old; three specimens.
958. Sugar Loaf Sound; depth, 6 feet; five months old; four specimens.
959. Metacombe Channel; depth, 12 feet; three to six months old; four specimens.
960. Saint Martin's Reef; depth, 8 feet; twelve months old.
961. Content's Key Channel; depth, 6 feet; four to six months old; four specimens.
962. Bahia Honda Channel; depth, 10 feet; three to six months old; four specimens.
963. Pepper Fish Keys; depth, 20 feet; six months old.
964. Key Vaccas Channel; depth, 10 feet; six to eight months old; four specimens.
965. Torch Key Channel; depth, 6 feet; eight months old; three specimens.
966. Biscayne Bay; depth, 8 feet; three to six months old; four specimens.
967. Rock Island; depth, 24 feet; nine months old.
968. Off Suwanee River; depth, 18 feet; twelve months old.
969. Dead Man's Bay; depth, 18 feet; eight months old.
970. Marquesas Keys Channel; depth, 12 feet; four months old; three specimens.
972. Soldier Key Bar; depth, 8 feet; twenty-five specimens.

INJURIOUS SPECIES.

Cliona sulphurea, Verrill. Boring Sponge. Atlantic coast, Cape Cod to South Carolina. Bores into oyster shells, submerged limestone, &c.

256. Vineyard Sound, Massachusetts. U. S. Fish Commission.*

* For references to other specimens, representing the younger stages of growth, and the boring habits of this species, see section of Mollusca.

LIST OF ENLARGED PHOTOGRAPHIC VIEWS, ILLUSTRATIVE OF THE LOBSTER FISHERY.

Lobster fishing at Rockport, Massachusetts.

Lobstermen's huts, dories, and Lobster pots, on the shore at Lanesville, Massachusetts.

Lobsterman's hut and pots at Menemsha Bight, Martha's Vineyard, Massachusetts.

Lobster boiling apparatus at Boston, Massachusetts.

LIST OF LOBSTER FISHING APPARATUS.

Series of Lobster pots, contained on one screen, showing the different styles used at present and in former times, on the New England coast. Actual size and models.

PRODUCTS OF THE LOBSTER, CRAB, AND SHRIMP FISHERIES.

For list of canned goods, see section of Products of the Fisheries.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

C.

CATALOGUE

OF THE

AQUATIC AND FISH-EATING BIRDS

EXHIBITED BY THE

UNITED STATES NATIONAL MUSEUM.

BY

ROBERT RIDGWAY,

CURATOR, DEPARTMENT OF BIRDS, U. S. NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.

PREFATORY NOTE.

The water birds of North America constitute almost exactly one-third of the total bird-fauna of the continent, the number of species and races known at the present time being 313, and of land birds, 642.*

Much the larger proportion of the aquatic species have more or less to do with the subject of the fisheries, for the reason that they are, to a greater or less extent, destructive to fishes or are themselves extensively used for bait, the latter being conspicuously the case at the Newfoundland Banks, where several species of petrels, more especially, on account of its greater abundance, the Greater Shearwater ("Hagdon," or "Old Hag," of the fishermen, *Puffinus major*), constitute the principal bait in the catching of codfish.

Several Families, or even entire Orders, of water birds are eminently destructive to the "finny tribe," some of them being entirely piscivorous, as the Order Steganopodes (including the pelicans, gannets, cormorants, and allied Families), while certain herons, some ducks (more especially the mergansers), the gulls and terns, loons or divers, grebes, and auks feed principally, if not entirely, upon fishes. In fact, with the exception of the "shore birds" (Order Limicolæ, including the snipes, sandpipers, plovers, and allied forms), "marsh birds" (Paludicolæ, or rail and crane tribes), and the herbivorous Anatidæ (swans, geese, and river ducks), all water birds may be said to be piscivorous to a greater or less degree.

Not water birds alone, however, claim attention as fish destroyers, several "land birds" being conspicuously noted for their piscatorial instincts. As examples, may be briefly mentioned the kingfishers (of which there are two North American species) and the fish hawk, or osprey; while even a Passerine bird, the American water ouzel, or dipper (*Cinclus mexicanus*), is said to work considerable havoc to the spawn of the trout and other fishes inhabiting the mountain districts of Western North America.†

---

* Of water birds there are 286 species and 27 geographical races, or subspecies; of land birds, 497 species and 145 races.

† Since these species cannot properly be included among the water birds, a list of the specimens exhibited is given herewith:

AMERICAN WATER OUZEL, or DIPPER, *Cinclus mexicanus*, Sw.—* No. 53340. Adult, source of American River, California, November 19, 1867; H. G. Parker.

BELTED KINGFISHER, *Ceryle alcyon* (L.).—* *a*. No. 77263, ♂ ad., Cook County, Illinois, April 21, 1870; Greene Smith. * *b*. No. 89875, Gainesville, Fla.; G. Shoemaker.

TEXAN KINGFISHER, *Ceryle americana cabanisi* (Tsch.).—* *a*. No. 29330, ♂ ad., Western

The following list of North American water birds is complete up to date. The numbers correspond strictly with those of the latest "Smithsonian" catalogue (Bulletin of the United States National Museum, No. 21), and the nomenclature is essentially the same, a few changes being found necessary in the light of more recent investigations, while several species subsequently added to the fauna have been interpolated in the proper places. The range of each species is indicated in general terms, followed by a list of the specimens exhibited.

An asterisk prefixed to the number of a specimen indicates that the specimen in question is a duplicate and may be exchanged.

Order HERODIONES.—The ALTRICIAL WADERS.

Family ARDEIDÆ.—The HERON TRIBE.

486. Ardea occidentalis Aud. GREAT WHITE HERON; WÜRDEMANN'S HERON. [488, 489.] Southern Florida. Accidental (?) in Southern Illinois. (Whole of "Austroriparian" Province?) Cuba; Jamaica.

486*. Ardea wardi Ridgw. WARD'S HERON. Southwestern Florida (vicinity of Oyster Bay).

a. No. 77946. ♂ ad. Hernando County, Florida, March 30, 1879; J. W. Milner.†

b. No. 77947. ♂ juv. Hernando County, Florida, March 19, 1879; J. W. Milner.

487. Ardea herodias Linn. GREAT BLUE HERON. [487.] Whole of temperate North America, Middle America, and West Indies; Galapagos; Venezuela.

a. No. 84576. ♂ ad. Knox County, Indiana, June 11, 1877; R. Ridgway.

b. No. 84578. ♀ juv. Wabash County, Illinois, September 26, 1870; R. Ridgway.

[**488.**] **Ardea cinerea** Linn. COMMON EUROPEAN HERON. Europe and other parts of the Old World; accidental in Greenland.

489. Herodias egretta (Gmel.). AMERICAN EGRET. [486, 486*a*.] Whole of America, except colder regions.

**a*. No. 86199. Ad., nuptial plumage. Gainesville, Florida, April, 1882; J. Bell.

Mexico, January, 1863; J. Xantus. **b*. No. 30455, ♀ ad., Costa Rica; Dr. A. von Frantzius.

AMERICAN FISH HAWK, OR OSPREY, *Pandion haliætus carolinensis* (Gm).—*a*. No. 77281, ♂ ad., Hernando County, Florida, February 24, 1876; Greene Smith. *b*. No. 84479, ♂ juv., Mount Carmel, Ill., September 5, 1870; R. Ridgway.

†The name of the collector of the specimen is given, whenever known, in preference to that of the donor, though of course the two are often identical.

490. Garzetta candidissima (Gmel.). SNOWY HERON. [485.] Whole of tropical and warm-temperate America.

a. No. 86487. Ad., nuptial plumage. Gainesville, Florida, May, 1882; J. Bell.*

491. Dichromanassa rufa (Bodd.). REDDISH EGRET; PEALE'S EGRET. [482, 483.] Southern United States, north to Southern Illinois, south to Yucatan, Guatemala, Mazatlan, and Cape Saint Lucas.

a. No. 84584. Ad., colored phase. Charlotte Harbor, Florida, June, 1874; J. Scholl.

b. No. 84583. Ad., white phase. (=*A. pealei* Bp.). Florida. (Presented by R. Ridgway.)

c. No. 17248. ♂ juv., colored phase. Cape Saint Lucas, December 6, 1859; J. Xantus.

492. Hydranassa tricolor ludoviciana (Wils.). LOUISIANA HERON. [484.] Southern States; north regularly to Carolinas, casually to New Jersey, Illinois, and Indiana; Mexico, Cuba, and Jamaica.

a. No. 73755. ♂ ad. Saint John's River, Florida, August 17, 1872; J. W. Driggs.

b. No. 78240. Juv. Tampa, Florida, June 28, 1879; Capt. R. H. Pratt.

(See also Group B of mounted birds.)

493. Florida cærulea (Linn.). LITTLE BLUE HERON. [490.] Southern United States east of Rocky Mountains, north, more or less regularly, to Massachusetts, Illinois, Kansas, etc.; south to Guiana and Colombia; whole of West Indies.

a. No. 73584. ♂ ad., blue phase. Saint John's River, Florida, August 16, 1877; J. W. Driggs.

**b*. No. 78388. ♂ juv. Washington, D. C., August 13, 1879; O. Smith.

c. No. 82057. Juv., trans. pl. Gainesville, Florida; J. Bell.

(See also Group B of mounted birds.)

494. Butorides virescens (Linn.). GREEN HERON. [493.] Whole of temperate North America, Middle America, and West Indies; Northern South America.

a. No. 88174. ♂ ad. Stamford, Connecticut; Dr. R. W. Shufeldt, U. S. A.

**b*. No. 75358. ♀ juv. Washington, D. C., August 23, 1878; Mr. Hamilton.

495. Nycticorax griseus nævius (Bodd.). BLACK-CROWNED NIGHT HERON. [495.] America in general, except colder regions.

a. No. 31982. ♂ ad. Fort Tejon, California; J. Xantus.

**b*. No. 80827. ♀ juv. Washington, D. C., August 16, 1880; Dr. R. Hessel.

496. Nycherodius violaceus (Linn.). WHITE-CROWNED NIGHT HERON. [496.] Southern States, breeding north to the Carolinas and Southern Illinois and Indiana; Colorado. Not recorded from Pacific coast north of Cape Saint Lucas; south to Western Ecuador and Amazonia.

a. No. 84596. ♀ ad. Wabash County, Illinois, May 6, 1874; S. Turner.

b. No. 86395. Juv. La Paz, Lower California, February 25, 1882; L. Belding.

497. Botaurus lentiginosus (Montag.). AMERICAN BITTERN. [492.] All of temperate North America; south to Guatemala, Cuba and Jamaica; occasional in Europe.

a. No. 65897. Juv. Long Coteau River, Dakota, September 8, 1873; Dr. E. Coues, U. S. A.

(See also Group A of mounted birds.)

498. Ardetta exilis (Gmel.). LEAST BITTERN. [491.] Whole of temperate North America, West Indies, Middle America, and Northern South America to Brazil.

(See Group B of mounted birds.)

Family CICONIIDÆ.—The STORK TRIBE.

499. Mycteria americana Linn. JABIRU. Tropical America, north to Southern Texas.

500. Tantalus loculator Linn. WOOD IBIS. [497.] Whole of tropical and warm-temperate America, except most of West Indies; Cuba.

a. No. 87928. Ad. Charlotte Harbor, Florida; J. Bell.

b. No. 78379. ♀ juv. Kissimee River, Florida; J. W. Driggs.

Family IBIDIDÆ.—The IBISES.

501. Eudocimus albus (Linn.). WHITE IBIS. [499.] Southern States; north, more or less regularly, to Southern Illinois, Pennsylvania, Connecticut, etc.; Utah. Not recorded from Pacific coast north of Cape Saint Lucas. South to Brazil and West Indies.

**a*. No. 87931. Ad. Charlotte Harbor, Florida; J. Bell.

**b*. No. 78450. Juv. Clearwater, Florida; Col. S. T. Walker.

502. Eudocimus ruber (Linn.). SCARLET IBIS. [498.] Tropical America, chiefly on the Atlantic side; accidental (?) in Louisiana and Southern Texas.

(See Group A of mounted birds.)

503. Plegadis falcinellus (Linn.). GLOSSY IBIS. [500.] Warmer parts of the Old World and portions of Eastern North America, including West Indies.

a. No. 42009. ♀ ad. Spanishtown, Jamaica. W. T. March.

504. Plegadis guarauna (Linn.). WHITE-FACED GLOSSY IBIS. [500*a*.] Tropical and subtropical America, north to Texas, Utah, Nevada, and Oregon.

a. No. 79829. ♂ ad. Washoe Lake, Nevada, June 3, 1877; H. W. Henshaw.

b. No. 58815. Juv. Mazatlan, Mexico; Col. A. J. Grayson.

(See also Group A of mounted birds.)

Family PLATALEIDÆ.—The SPOONBILLS.

505. Ajaja rosea Reich. ROSEATE SPOONBILL. [501.] Southern States, and southward throughout tropical America to Buenos Ayres.

(See Group B of mounted birds.)

Order LIMICOLÆ.—The SHORE-BIRDS.

Family HÆMATOPODIDÆ.—The OYSTER-CATCHERS.

[**506.**] **Hæmatopus ostralegus** Linn. EUROPEAN OYSTER-CATCHER. Various portions of the Old World; accidental in Greenland.

507. Hæmatopus palliatus Temm. AMERICAN OYSTER-CATCHER. [512.] Coasts of America in general, except Pacific coast north of Cape Saint Lucas.

**a*. No. 80264. Pullus. Bone Island, Virginia, July, 1880; R. Ridgway.

508. Hæmatopus niger Pall. BLACK OYSTER-CATCHER. [513.] Pacific coast of North America; south to Lower California.

a. No. 79831. ♀ ad. Santa Cruz, California, June 4, 1875; H. W. Henshaw.

Family STREPSILIDÆ.—The TURNSTONES.

509. Strepsilas interpres Linn. TURNSTONE. [515.] Sea-coasts of nearly all parts of the world.

a. No. 1692. ♂ ad. Philadelphia, Pennsylvania, Spring 1843; J. Cassin.

b. No. 88769. ♂ juv. Point Barrow, Alaska, July 29, 1882; M. Smith.

510. Strepsilas melanocephala Vig. BLACK TURNSTONE. [516.] Pacific coast of North America, south to California.

a. No. 73466. Ad. Saint Michael's, Alaska; E. W. Nelson.
b. No. 75711. Juv. Saint Michael's, Alaska; E. W. Nelson.

511. Aphriza virgata (Gmel.). SURF BIRD. [511.] Pacific coast of America, from Alaska to Chili; Sandwich Islands.

a. No. 24256. ♀ juv. San Francisco, California, September 11, 1856; J. Hepburn.

Family CHARADRIIDÆ.—The PLOVERS.

[**512.**] **Vanellus cristatus** Meyer. LAPWING. Europe and other parts of the Old World; accidental in Greenland (and Alaska?).

513. Squatarola helvetica (Linn.). BLACK-BELLIED PLOVER. [510.] Nearly cosmopolitan, but chiefly the northern hemisphere, breeding far northward.

a. No. 532. ♀ ad. Summer, Eastern United States; Prof. S. F. Baird.
b. No. 88239. Ad. Winter, Stamford, Connecticut; Dr. R. W. Shufeldt, U. S. A.

514. Charadrius pluvialis Linn. GOLDEN PLOVER. Palæarctic region and Eastern Greenland.

515. Charadrius dominicus Müll. AMERICAN GOLDEN PLOVER. [503.] North America in general, breeding near arctic coast.

**a.* No. 88771. ♂ ad. Point Barrow, Alaska, June 12, 1882; J. Murdoch.
b. No. 77272. ♂ ad., trans. plum. Logan County, Illinois, April 10, 1881; G. Smith.
**c.* No. 85472. Ad., wint. plum. Mount Carmel, Illinois, March 21, 1875; S. Turner.

[**515.**] **Charadrius dominicus fulvus** (Gmel.). PACIFIC GOLDEN PLOVER. Eastern Asia, Pacific islands, and coast of Alaska.

a. No. 89257. Juv. Saint Michael's, Alaska; E. W. Nelson.

516. Oxyechus vociferus (Linn.). KILDEER. [504.] Temperate North America in general, migrating south to Colombia, West Indies, and Bermudas; accidental in British Islands.

**a.* No. 88240. Ad. Dr. R. W. Shufeldt, U. S. A.
b. No. 67687. Juv. Three Buttes, Montana, August 10, 1874; Dr. E. Coues, U. S. A.
c. No. 80107. Pullus. Fort Whipple, Arizona, August 10, 1869; Dr. E. Palmer.

517. Ægialites semipalmatus Bonap. SEMIPALMATED PLOVER. [507.] Nearly the whole of America, but breeding only far northward.

a. No. 88241. ♂ ad. Cayuga Lake, New York, May 25, 1872; Dr. R. W. Shufeldt, U. S. A.

**b*. No. 58387. Juv. Fort Macon, North Carolina, September 2, 1866; Dr. E. Coues, U. S. A.

c. No. 20874. Pullus. Fort George, Hudson's Bay Territory, July 10, 1860; C. Drexler.

518. Ægialites hiaticula (Linn.). RINGED PLOVER. Palæarctic region and portions of Eastern Arctic America, including Greenland.

a. No. 76133. ♂ ad. Head of Cumberland Gulf, June 27, 1878; L. Kumlien.

b. No. 76134. Juv. Gothaab, Greenland, Augnst 14, 1868; L. Kumlien.

[**519.**] **Ægialites curonicus** (Gmel.). LITTLE RINGED PLOVER. Palæarctic region; accidental in California and Alaska (?).

520. Ægialites melodus (Ord.). PIPING PLOVER. [508.] Atlantic coast of United States.

a. No. 76753. ♂ ad. Cape May, New Jersey; Dr. A. L. Heermann.

520a. Ægialites melodus circumcinctus Ridgw. BELTED PIPING PLOVER. Mississippi Valley.

521. Ægialites alexandrinus nivosus (Cass.). SNOWY PLOVER. [509.] Western America, north to California and Utah, south to Chili; Yucatan; Cuba (?).

**a*. No. 72732. ♂ ad. Santa Barbara, California, July 8, 1875; H. W. Henshaw.

**b*. No. 72715. ♀ ad. Santa Barbara, California, July 4, 1875; H. W. Henshaw.

c. No. 78190. Juv. Santa Cruz, California; W. A. Cooper.

521.' Ægialites mongolicus (Pall.). MONGOLIAN PLOVER. Northeastern Asia; Alaska (Choris Peninsula).

522. Ochthodromus wilsonius (Ord.). WILSON'S PLOVER. [506.] Atlantic coast of United States, south to West Indies and Brazil; Pacific coast of Middle America, north to Lower California.

**a*. No. 80346. ♂ ad. Bone Island, Virginia, July 16, 1880; P. L. Jouy.

**b*. No. 57928. ♀ ad. Fort Macon, North Carolina, June 10, 1869; Dr. E. Coues, U. S. A.

523. Podasocys montanus (Towns.). MOUNTAIN PLOVER. [505.] Western United States, north to British Provinces.

**a*. No. 67679. ♂ ad. Frenchman's River, Dakota, July 4, 1874; Dr. E. Coues, U. S. A.

**b*. No. 69787. Juv. Pueblo, Colorado, July 30, 1874; C. E. Aiken.

c. No. 67674. Pullus. Frenchman's River, Dakota, July 9, 1874; Dr. E. Coues, U. S. A.

Family SCOLOPACIDÆ.—The Snipe Tribe.

[**524.**] **Scolopax rusticula** Linn. European Woodcock. Palæarctic region; occasional in Eastern North America (several records).

525. Philohela minor (Gmel.). American Woodcock. [522.] Eastern United States, north to Canada and Nova Scotia.

**a*. No. 84625. ♀ ad. District of Columbia, June 30, 1860; D. W. Prentiss.

b. No. 84626. ♂ ad. District of Columbia; Dr. E. Coues.

526. Gallinago media (Leach). English Snipe. Palæarctic region, straggling to Greenland and the Bermudas.

526a. Gallinago media wilsoni (Temm.). Wilson's Snipe. [523.] Whole of North America, south in winter to Panama and West Indies.

a. No. 79745. ♀ ad. Long Valley, California, June 22, 1877; H. W. Henshaw.

**b*. No. 88246. Ad. Dr. R. W. Shufeldt, U. S. A.

527. Macrorhamphus griseus (Gmel.). Red-breasted Snipe; Gray Snipe. [524.] Eastern North America, breeding far northward.

a. No. 76348. Ad. Bellport, Long Island, June 7, 1878; C. S. Allen.

**b*. No. 80270. ♂ ad. Bone Island, Virginia, July 14, 1880; R. Ridgway.

c. No. 58393. Juv. Fort Macon, North Carolina, July, 1869; A. C. Beale.

527a. Macrorhamphus griseus scolopaceus (Say). Red-bellied Snipe; Greater Gray-back. [525.] Western North America, including Mississippi Valley, north to Alaska, and "barren grounds" of arctic districts; occasional on Atlantic coast.

**a*. No. 70250. ♀ ad. Saint Michael's, Alaska; L. M. Turner.

**b*. No. 65568. ♀ juv. Souris River, Dakota, August 10, 1873; Dr. E. Coues, U. S. A.

c. No. 76756. Cape May, May 10, 1848; D. G. Eliot.

d. No. 65569. ♀ juv. Souris River, Dakota, October 1, 1873; Dr. E. Coues, U. S. A.

528. Micropalama himantopus (Bonap.). Stilt Sandpiper. [536.] Eastern North America, breeding far northward; Middle America, West Indies, and greater part of South America in winter.

a. No. 69917. ♂ ad. Laramie, Wyoming; Dr. C. G. Newberry.

b. No. 58909. ♀ San Mateo, Tehuantepec, February 24, 1869; Prof. F. Sumichrast.

c. No. 67691. Juv. Chief Mountain, August 16, 1874; Dr. E. Coues, U. S. A.

529. Tringa canutus Linn. KNOT; ROBIN SNIPE. [526.] Sea-coasts and borders of larger inland waters nearly throughout the world, but chiefly northern hemispheres, and breeding in arctic regions.

a. No. 88818. ♂ ad. Point Barrow, Alaska, July 5, 1882; J. Murdoch.
b. No. 84632. ♀ ad. Cambridge, Massachusetts, May, 1871; W. Brewster.
c. No. 61248. Juv. Wood's Holl, Massachusetts; E. Palmer.

530. Arquatella maritima (Brünn.). PURPLE SANDPIPER. [528.] Northeastern North America; south in winter to coast coast of New England and Great Lakes; Palæarctic region.

a. No. 76163. ♀ ad. Gulf of Cumberland, 1878; L. Kumlien.
b. No. 49150. Ad., winter. Milltown, Maine; G. A. Boardman.
c. No. 76153. ♀ juv. Arctic Island, Cumberland Gulf, September 13, 1879; L. Kumlien.

531. Arquatella couesi Ridgw. ALEUTIAN SANDPIPER. Aleutian Islands and coast of Alaska, south in winter to British Columbia.

**a.* No. 85607. Ad. Atkha Island; L. M. Turner.
**b.* No. 46169. Ad., winter dress. Sitka, Alaska, October, 1866; F. Bischoff.
c. No. 75792. Juv. Alaska; E. W. Nelson.

532. Arquatella ptilocnemis Coues. PRYBILOV SANDPIPER. Prybilov (or Seal) Islands, Alaska.

**a.* No. 62429. ♀ ad. Saint Paul's Island, Alaska; H. W. Elliott.

[**533.**] **Actodromas acuminata** (Horsf.). SHARP-TAILED SANDPIPER. Eastern Asia and Western Alaska; south in winter to Australia, etc.

a. No. 89255. Juv. Alaska; E. W. Nelson.

534. Actodromas maculata (Vieill.). PECTORAL SANDPIPER. [531.] America in general, breeding in arctic regions.

**a.* No. 88856. ♂ ad. Point Barrow, Alaska, July 1, 1882; M. Smith.
**b.* No. 67703. Ad. Three Buttes, Montana, August 11, 1874; Dr. E. Coues, U. S. A.
**c.* No. 18839. Juv. Moose Factory, Hudson's Bay Territory, September 8, 1860; C. Drexler.

535. Actodromas cooperi (Baird). COOPER'S SANDPIPER. [527.] Long Island, New York. (Only one specimen known!)

536. Actodromas fuscicollis (Vieill.). BONAPARTE'S SANDPIPER. [533.] Eastern North America, breeding far northward; nearly all of South America in migrations.

a. No. 55594. ♂ ad. Fort Macon, North Carolina, May, 1869; Dr. E. Coues, U. S. A.

537. Actodromas bairdi Coues. BAIRD'S SANDPIPER. Western America, from arctic regions to Patagonia and Buenos Ayres, but breeding only far northward.

*a. No. 88843. ♀ ad. Point Barrow, Alaska, June 11, 1882; M. Smith.
*b. No. 69793. ♂ juv. Camp Crittenden, Arizona, September 12, 1874; H. W. Henshaw.

538. Actodromas minutilla (Vieill.). LEAST SANDPIPER. [532.] All of America, but breeding only in colder portions of northern continent.

*a. No. 59703. Ad. Isthmus Tehuantepec, November 10, 1869; F. Sumichrast.
*b. No. 80072. ♀ juv. Fort Tejon, California; J. Xantus.

[**539.**] **Pelidna alpina** (Linn.). EUROPEAN DUNLIN. Palæarctic region; casual in Greenland and vicinity of Hudson's Bay.

539a. Pelidna alpina americana (Cass.). RED-BACKED SANDPIPER. [530.] North America and Northeastern Asia, breeding far northward.

*a. No. 88879. ♂ ad. Point Barrow, Alaska, June 5, 1883; J. Murdoch.
*b. No. 88870. ♀ ad. Point Barrow, Alaska, June 4, 1882; J. Murdoch.
c. No. 79166. Ad., winter plumage. Stockton, California, December, 1879; L. Belding.
d. No. 88874. ♂ juv. Point Barrow, Alaska, July 20, 1882; J. Murdoch.

[**540.**] **Pelidna subarquata** (Guld.). CURLEW SANDPIPER. [529.] Palæarctic region; casual in Eastern North America.

541. Ereunetes pusillus (Linn.). SEMIPALMATED SANDPIPER. [535.] Northern and Eastern North America, and, in winter, nearly the whole of tropical America; breeding toward arctic coast.

a. No. 55596. ♂ ad. Fort Macon, North Carolina, May 4, 1869; Dr. E. Coues.
*b. No. 34459. ♀ ad. Republican Fork, Kansas, May 23, 1864; Dr. E. Coues.
*c. No. 88834. Juv. Point Barrow, Alaska, July 29, 1882; J. Murdoch.

541a. Ereunetes pusillus occidentalis (Lawr.). WESTERN SANDPIPER. Western North America, breeding in Alaska.

*a. No. 89256. Ad. Kodiak, Alaska; F. Bischoff.
*b. No. 40947. Ad., winter. San Pedro, California; Dr. E. Coues, U. S. A.

542. Calidris arenaria (Linn.). SANDERLING. [534.] Nearly cosmopolitan during migrations, but breeding only far northward.

*a. No. 40943. Ad. San Pedro, California, November, 1865; Dr. E Coues, U. S. A.
*b. No. 70380. Juv. Ainsworth, Illinois, September, 1874; E. W. Nelson.

542.* Eurynorhynchus pygmæus (Linn.). SPOONBILL SANDPIPER. Eastern Asia, breeding far northward; coast of Alaska (Choris Peninsula).

543. Limosa fœda (Linn.). MARBLED GODWIT. [547.] Temperate North America, chiefly eastern portions; south in winter to Guatemala and Cuba.

**a*. No. 59770. Ad. Tehuantepec, August 5, 1869; F. Sumichrast.

544. Limosa lapponica novæ-zealandiæ Gray. PACIFIC GODWIT. Pacific Islands and coast of Eastern Asia, south to Australia and New Zealand; abundant on islands and coast of Alaska; accidental at Cape Saint Lucas.

**a*. No. 85611. Ad. Atkha Island; L. M. Turner.
b. No. 62447. ♀ Saint Paul's Island, Alaska; H. W. Elliott.

545. Limosa hæmastica (Linn.). HUDSONIAN GODWIT. [548.] Whole of America, but breeding far northward.

a. No. 20883. Ad. Mankato, Minnesota; J. M. Woodworth.
**b*. No. 70142. Ad. Chicago, L. C. Illinois; S. C. Bowman.
c. No. 49146. ♀ Winter, Magellan, Chili; Nat. Mus. of Chili.

[546.] Limosa ægocephala (Linn.). BLACK-TAILED GODWIT. Palæarctic region; casual in Greenland.

547. Totanus glottis (Linn.). GREEN-SHANK. [538.] Palæarctic region and other portions of the Old World; accidental in Florida.

548. Totanus melanoleucus (Gmel.). GREATER YELLOW-LEGS; TELL-TALE. [539.] Breeding in colder portions of North America, south to northern border of United States, and in migrations extending over whole of Middle America, South America, and West Indies.

a. No. 1301. ♂ ad. Carlisle, Pennsylvania, March 19, 1844; Prof. S. F. Baird.
**b*. No. 65576. Juv. Souris River, Dakota, August 23, 1873; Dr. E. Coues, U. S. A.

549. Totanus flavipes (Gmel.). YELLOW-LEGS. [540.] Whole of America, but warmer portions only in winter, and rare in Western North America.

a. No. 54599. ♂ ad. Nulato River, Alaska, May 21, 1868; W. H. Dall.
b. No. 65588. Juv. Souris River, Dakota, August 21, 1873; Dr. E. Coues, U. S. A.

550. Rhyacophilus solitarius (Wils.). SOLITARY SANDPIPER. [541.] America in general, breeding in north temperate regions; accidental in Europe.

a. No. 82388. ♀ ad. Washington, District of Columbia, May 21, 1881, G. Shoemaker.

b. No. 67723. Juv. Three Buttes, Montana, August 10, 1874, Dr. E. Coues, U. S. A.

551. Rhyacophilus ochropus (Linn.). GREEN SANDPIPER. Palæarctic region; accidental in Nova Scotia.

552. Symphemia semipalmata (Gmel.). WILLET. [537.] Temperate North America; south in winter to the tropics, as far as Brazil; accidental in Europe.

a. No. 61579. Ad. Halleck, Nevada, May 5, 1871; J. Kohler.

b. No. 59768. ♀ ad., winter dress. San Mateo, Tehuantepec, August 6, 1869; Prof. F. Sumichrast.

c. No. 80267. ♀ Juv. Bone Island, Virginia, July, 1880; R. Ridgway.

553. Heteroscelus incanus (Gmel.). WANDERING TATTLER. [542.] Islands and shores of the Pacific Ocean, including western coast of America from Alaska to the Galapagos.

a. No. 75831. Alaska; E. W. Nelson.

b. No. 73441. Sannak Islands, Alaska, May 15, 1877; E. W. Nelson.

554. Machetes pugnax (Linn.). RUFF. [544.] Palæarctic region; occasional in Eastern North America.

555. Bartramia longicauda (Bechst.). BARTRAM'S SANDPIPER; FIELD PLOVER. [545.] Eastern North America, north to Nova Scotia and Eastern Alaska, west to Utah; in winter, south to West Indies, Brazil, and and Peru; casual in Europe.

a. No. 64013. ♂ ad. Pembina, Dakota Territory, June 11, 1873; Dr. E. Coues, U. S. A.

b. No. 1116. ♀ juv. Carlisle, Pennsylvania, July 15, 1843; Prof. Baird.

556. Tryngites rufescens (Vieill.). BUFF-BREASTED SANDPIPER. [546.]. North America in general, but chiefly the interior, breeding far northward; in winter, south to Peru and Uruguay; Cuba; occasional in Europe.

a. No. 88885. ♂ ad. Point Barrow, Alaska, June 11, 1882; M. Smith.

b. No. 84655. ♀ juv. Massachusetts, September 6, 1871; H. W. Henshaw.

557. Tringoides macularius (Linn.). SPOTTED SANDPIPER. [543.] Whole of North America, breeding nearly throughout its range; south in winter to Brazil, including all of West Indies.

a. No. 84659. ♀ ad. Carson City, Nevada, April 28, 1868; R. Ridgway.

b. No. 84660. ♂ juv. Camp Patterson, Illinois, July 25, 1876; H. K. Coale.

558. Numenius longirostris (Wi's.). LONG-BILLED CURLEW. [549.] Temperate North America; south in winter to Cuba, Jamaica, Guatemala, and Brazil (?).

a. No. 9837. ♂ San Francisco, California; Dr. A. L. Heermann.
**b.* No. 63578. ♂ ad. Filmore, Utah Territory, November 19, 1872; H. W. Henshaw.

559. Numenius hudsonicus (Lath.). HUDSONIAN CURLEW. [550.] Whole of America, but breeding in arctic and sub-arctic districts; in winter throughout West Indies and greater extent of South America; Greenland.

**a.* No. 80073. Ad. Cape Saint Lucas, Lower California; J. Xantus.

560. Numenius borealis (Forst.). ESKIMO CURLEW. [551.] Northern and Eastern North America, and Southern South America; no West Indian record; Greenland and occasionally in Europe.

**a.* No. 52130. ♀ ad. Lower Anderson River, Arctic America; R. McFarlane.

[**561.**] **Numenius phæopus** (Linn.). WHIMBREL. Palæarctic, African, and Indo-Malayan regions; accidental in Greenland.

[**562.**] **Numenius tahitiensis** (Gmel.). BRISTLE-THIGHED CURLEW. Pacific Islands and coast of Alaska.

Family PHALAROPODIDÆ.—The PHALAROPES.

563. Phalaropus fulicarius (Linn.). RED PHALAROPE. [521.] Northern hemisphere, breeding far northward.

a. No. 75245. ♀ ad., winter dress. 128 miles east by south of Cape Ann, Massachusetts, August 31, 1878; R. L. Newcomb.
**b.* No. 18626. ♀ ad. Greenland; Univ. Zool. Mus. Copenhagen.
c. No. 88794. ♀ ad. Point Barrow, Alaska, August 3, 1882; J. Murdoch.

564. Lobipes hyperboreus (Linn.). NORTHERN PHALAROPE. [520.] Northern hemisphere, circumpolar in summer, but breeding further south on higher mountain ranges.

a. No. 59713. ♂ Tehuantepec, October 24, 1869; Prof. F. Sumichrast.
b. No. 64281. ♀ ad. Saint George's Island, Alaska, July 22, 1875; H. W. Elliott.

565. Steganopus wilsoni (Sab.). WILSON'S PHALAROPE. [519.] In summer, chiefly interior districts of North America (not recorded from Pacific coast); in winter, migrating far southward (Patagonia, Brazil, &c.).

**a.* No. 69803. ♂ ad. Sienaga, Arizona, August 30 1874; H. W. Henshaw.

565. Steganopus wilsoni—Continued.

*b. No. 10393. ♂? ad. Dane County, Wisconsin, May 20, 1855; T. Kumlien.

*c. No. 67742. ♂ ad. Frenchman's River, Dakota; Dr. E. Coues, U. S. A.

*d. No. 17536. ♂ juv. Cold Springs, California, July 27, 1877; H. W. Henshaw.

Family RECURVIROSTRIDÆ.—The AVOCETS.

566. Recurvirostra americana Gmel. AMERICAN AVOCET. [517.] Whole of temperate North America; south, in winter, to Guatemala, Cuba, and Jamaica.

*a. No. 34433. ♀ ad. Near Fort Larned, Kansas, June 2, 1864; Dr. E. Coues, U. S. A.

*b. No. 67764. Juv. Chief Mountain, Dakota, August 29, 1874; Dr. E. Coues, U. S. A.

567. Himantopus mexicanus (Müll.). BLACK-NECKED STILT. [518.] Whole of temperate North America, Middle America, and Northern South America, to Brazil, Peru, Galapagos, etc.; West Indies.

*a. No. 79929. ♂ ad. Salt Lake City, Utah, June 3, 1869; R. Ridgway.

Order PALUDICOLÆ.—The MARSH-BIRDS.

Family PARRIDÆ.—The JAÇANAS.

568. Parra gymnostoma Wagl. MEXICAN JAÇANA. Middle America, north to Lower Rio Grande Valley in Texas; Cuba; Hayti?

Family RALLIDÆ.—The RAIL TRIBE.

569. Rallus elegans Aud. RED-BREASTED RAIL. [542.] Fresh-water marshes of Eastern United States.

569*. Rallus beldingi Ridgw. BELDING'S RAIL. Salt-water marshes of Lower California.

570. Rallus obsoletus Ridgw. CALIFORNIAN CLAPPER RAIL. Salt-water marshes of Pacific coast of United States, south to western coast of Lower California.

*a. No. 84672. Ad. San Francisco, California, April, 1877; E. W. Nelson.

571. Rallus longirostris crepitans (Gmel.). CLAPPER RAIL. [553.] Salt-water marshes of Atlantic coast of United States.

*a. No. 80353. ♂ ad. Cobb's Island, Virginia, July 20, 1880; P. L. Jouy.

*b. No. 80358. ♂ pullus. Cobb's Island, Virginia; P. L. Jouy.

571a. Rallus longirostris saturatus Hensh. LOUISIANA CLAPPER RAIL. Salt-water marshes of Gulf coast of United States from Western Florida to Louisiana.

a. No. 87919. Juv. Charlotte Harbor, Florida; J. Bell.
b. No. 87920. Pullus. Charlotte Harbor, Florida; J. Bell.

572. Rallus virginianus Linn. VIRGINIA RAIL. [554.] Entire temperate North America, south to Cuba and Guatemala.

**a*. No. 79364. Ad. D. W. Scott.

573. Porzana maruetta (Leach). SPOTTED CRAKE. Palæarctic region; accidental in Greenland.

574. Porzana carolina (Linn.). SORA RAIL. CAROLINA RAIL. [555.] Entire temperate North America; Middle America and West Indies in winter.

**a*. No. 86481. Ad. Gainesville, Florida, May, 1882; J. Bell.
b. No. 1649. ♂ juv. Carlisle, Pennsylvania, July 27, 1844; Prof. S. F. Baird.

575. Porzana noveboracensis (Gmel.). LITTLE YELLOW RAIL. [557.] Eastern United States, west to Utah and Nevada.

a. No. 29743. Ad. Winnebago, Illinois, May 17, 1863; J. W. Tolman.

576. Porzana jamaicensis (Gmel.). LITTLE BLACK RAIL. [556.] Warm-temperate, and tropical America in general; north to California, Illinois, and Massachusetts; south to Chili.

a. No. 41898. Ad. (?) West Kansas; A. Crocker.

576a. Porzana jamaicensis coturniculus Baird. FARALLONE RAIL. Farallone Islands, coast of California.

[**577.**] **Crex pratensis** Bechst. CORN CRAKE. [558.] Palæarctic region; casual in Eastern United States.

578. Ionornis martinica (Linn.). PURPLE GALLINULE. [561.] Warmer parts of North and South America, and throughout West Indies; north, casually, to northern border of United States, but not recorded from Pacific coast.

**a*. No. 86478. Ad. Gainesville, Florida, May, 1882; J. Bell.

579. Gallinula galeata (Licht.). FLORIDA GALLINULE. [560.] Temperate North America, Middle America, and West Indies.

**a*. No. 86474. Ad. Gainesville, Florida, May, 1882; J. Bell.

580. Fulica americana Gmel. AMERICAN COOT. [559.] Whole of North America (except extreme northern portions), Middle America, and West Indies.

*a. No. 84687. Ad. Mount Carmel, Illinois; S. Turner.
*b. No. 65555. Juv. Souris River, Dakota, October 1, 1873; Dr. E. Coues, U. S. A.

580.* Fulica atra Linn. EUROPEAN COOT. Palæarctic region; accidental in Greenland.

Family ARAMIDÆ.—The COURLANS.

581. Aramus pictus Bartr. LIMPKIN; FLORIDA COURLAN. [481.] Greater Antilles, Florida, and coasts of Central America.

*a. No. 73760. ♀ ad. Wekiva River, Florida, August 29, 1877; J. W. Driggs.

Family GRUIDÆ.—The CRANES.

582. Grus americana (Linn.). WHOOPING CRANE. [478.] Interior districts of North America, north to the Saskatchewan, south to Florida, Texas, and Central Mexico.

a. No. 35445. Juv. Chicago, Illinois; Chicago Academy of Sciences.
b. No. 59826. ♂ ad. Burlington, Kansas, April 16, 1867; A. Crocker.

583. Grus pratensis Bartr. SANDHILL CRANE. [479.] Temperate North America, but chiefly in Mississippi Valley and westward; south to Central Mexico.

a. No. 18066. ♂ ad. Fort Crook, California, April 20, 1860; Capt. J. Feilner.

584. Grus canadensis (Linn.). LITTLE CRANE. [480.] Northern North America, breeding from Alaska to Hudson's Bay and along arctic coast, and migrating southward in winter.

a. No. 75699. Ad. Alaska; E. W. Nelson.
b. No. 77502. Juv. Cold Springs, California; H. W. Henshaw.

Order PHŒNICOPTERI.—The LAMELLIROSTRAL WADERS.

Family PHŒNICOPTERIDÆ.—The FLAMINGOES.

585. Phœnicopterus ruber Linn. AMERICAN FLAMINGO. [502.] Atlantic coast of Middle America, north to Florida, Bermudas, and some others of the West Indies, south to Northern South America; Galapagos?

a. No. 84693. ♀ ad. South Florida, summer, 1874; J. C. Scholl.

Order ANSERES.—The LAMELLIROSTRAL SWIMMERS.

Family ANATIDÆ.—The DUCK TRIBE.

[**586.**] **Olor cygnus** (Linn.). EUROPEAN SWAN. Palæarctic region; casual in South Greenland.

[**587.**] **Olor bewicki** (Yarrell). BEWICK'S SWAN. Northern part of Palæarctic region (very doubtfully American).

588. Olor columbianus (Ord.). WHISTLING SWAN. [561 *a*.] North America in general, breeding far northward; accidental in Scotland.

a. No. 86026. ♀ ad. Currituck Sound, North Carolina; I. Hinckley.
b. No. 81230. Juv. Saint Michael's, Alaska; E. W. Nelson.

589. Olor buccinator (Rich.). TRUMPETER SWAN. [562.] Interior of North America; more rare on the Pacific, and casual on the Atlantic coast; breeding from Iowa and Dakota northward.

590. Chen cærulescens (Linn.). BLUE-WINGED GOOSE. [564.] Interior districts of North America, breeding northward; migrating south through Mississippi Valley.

a. No. 77308. ♀ ad. Logan County, Illinois, April 28, 1871; Smith.
b. No. 84694. Juv. Chicago, Illinois, October, 1875; E. W. Nelson.

591. Chen hyperboreus (Pall.). SNOW GOOSE. [563.] North America in general, breeding toward arctic coast; more abundant eastward.

a. No. 79109. Juv. Johnston Town, Virginia; C. R. Moore.

591a. Chen hyperboreus albatus (Cass.). LESSER SNOW GOOSE. [563 *a*.] North America in general, breeding far northward; more numerous westward.

a. No. 88968. ♂ ad. Point Barrow, Alaska, June 13, 1882; J. Murdoch.
b. No. 84695. Juv. Chicago, Illinois, November, 1875; E. W. Nelson.

592. Chen rossi (Baird). ROSS'S SNOW GOOSE. Western North America, breeding in arctic districts between McKenzie River and Hudson's Bay (?).

a. No. 77163. Ad. Stockton, California, December, 1878; L. Belding.

[**593.**] **Anser albifrons** (Gmel.). EUROPEAN WHITE-FRONTED GOOSE. Palæarctic region; breeding also in Southeastern Greenland.

593a. Anser albifrons gambeli (Hartl.). AMERICAN WHITE-FRONTED GOOSE. [565, 566.] North America in general, breeding far northward.

a. No. 88971. ♂ ad. Point Barrow, Alaska, June 19, 1882; J. Murdoch.

594. Bernicla canadensis (Linn.). CANADA GOOSE. [567.] United States (except Pacific coast?) and British Provinces; breeding (at present) chiefly north of 40°.

a. No. 77545. Ad. Camp Bidwell, California, September 28, 1877; H. W. Henshaw.

594a. Bernicla canadensis hutchinsi (Sw. & Rich.). HUTCHINS'S GOOSE. [569.] Breeding in the arctic districts, from the Yukon to Hudson's Bay, migrating south in winter chiefly through Mississippi Valley and westward.

a. No. 88980. ♂ juv. Crow Island, North Carolina, November 21, 1882; I. Hinckley.

594b. Bernicla canadensis leucoparia (Brandt). WHITE-CHEEKED GOOSE. [568.] Breeding along the coast of Alaska, and thence westward through Aleutian chain to Kamtschatka; south in winter along Pacific coast to California, and occasionally straggling eastward.

a. No. 81234. ♂ ad. Saint Michael's, Alaska; E. W. Nelson.
b. No. 81233. ♀ ad. Saint Michael's, Alaska; E. W. Nelson.

594c. Bernicla canadensis occidentalis (Baird). LARGER WHITE-CHEEKED GOOSE. [567 *a*.] Coast of Southern Alaska and British Columbia in summer; south to California in winter.

595. Bernicla brenta (Pall.). BRANT. [570.] Sea-coasts of Europe and Eastern North America, breeding in extreme arctic regions; rare inland.

a. No. 84705. ♀ ad. Fire Island, New York; J. H. Batty.

596. Bernicla nigricans (Lawr.). BLACK BRANT. [571.] Western districts of Arctic America, south in winter to Lower California; casual on Atlantic coast.

a. No. 81236. Juv. Saint Michael's, Alaska; E. W. Nelson.
(See also Group C of mounted birds.)

[**597.**] **Bernicla leucopsis** (Temm.). BARNACLE GOOSE. [572.] Sea-coasts of Palæarctic region, straggling to Eastern North America (several records, from Hudson's Bay to North Carolina).

598. Philacte canagica (Sevast.). EMPEROR GOOSE. [573.] Sea-coast and islands of Alaska, north of the peninsula.

(See Group C of mounted birds.)

599. Dendrocycna autumnalis (Linn.). BLACK-BELLIED TREE DUCK. [574.] Middle America, north to Rio Grande Valley in Texas.

(See Group D of mounted birds.)

600. Dendrocycna fulva (Gmel.). FULVOUS TREE DUCK. [575.] Middle America, north to Louisiana, Texas, Nevada, and California; Southern Brazil, Buenos Ayres, and Paraguay.

(See Group D of mounted birds.

601. Anas boscas Linn. MALLARD. [576.] Entire northern hemisphere.

a. No. 84708. ♂ ad. Mount Carmel, Illinois, October 19, 1869; R. Ridgway.

b. No. 79865. ♂ ad., changing. Camp Bidwell, California, August 2, 1878; H. W. Henshaw.

602. Anas obscura Gmel. BLACK MALLARD. [577.] Eastern North America, breeding from Maine northward; west to Utah.

(See Group F of mounted birds.)

603. Anas fulvigula Ridgw. FLORIDA DUSKY DUCK. Florida.

a. No. 86008. Ad. Salt Lake, Florida, February, 1872; W. Brewster.

604. Chaulelasmus streperus (Linn.). GADWALL. [584.] Whole northern hemisphere.

a. No. 77595. ♂ ad. Washoe Lake, Nevada, May, 1877; H. W. Henshaw.

b. No. 84711. ♀ ad. Evanston, Illinois, November 4, 1874; E. W. Nelson.

605. Dafila acuta (Linn.). PINTAIL. [578.] Northern Hemisphere in general.

a. No. 84713. ♂ ad. Coney Island, New York; J. H. Batty.

b. No. 85479. ♀ ad. Mount Carmel, Illinois, December 30, 1875; S. Turner.

606. Mareca penelope (Linn.). WIGEON. [586.] Palæarctic region; occasional in Eastern North America, and more frequent in Alaska.

607. Mareca americana (Gmel.). BALDPATE. [585.] North America in general.

b. No. 76767. ♀ ad. Summer; American Museum, New York.

(See also Group E of mounted birds.)

608. Spatula clypeata (Linn.). SHOVELER. [583.]

a. No. 84715. ♂ ad. Mount Carmel, Illinois, March 12, 1877; J. L. Ridgway.

609. Querquedula discors (Linn.). BLUE-WINGED TEAL. [581.] North America generally, but chiefly eastern portions; south in winter throughout West Indies and Middle America to Ecuador; accidental in Europe.

b. No. 33688. ♀ ad. Dueñas, Guatemala, November, 1861; O. Salvin.

(See also Group E of mounted birds.)

610. Querquedula cyanoptera (Vieill.). CINNAMON TEAL. [582.] Western America, from the Columbia River to Chili, Buenos Ayres, and FalklandIslands; east (occasionally) to Mississippi Valley.

b. No. 84721. ♀ ad. Stockton, California, April, 1879; L. Belding.
(See Group E of mounted birds.)

611. Nettion crecca (Linn.). ENGLISH TEAL. [580.] Palæarctic region; occasional in Eastern North America.

612. Nettion carolinensis (Gmel.). GREEN-WINGED TEAL. [579.] Whole of North America.

b. No. 71291. ♀ ad. Madisonville, Ohio, March 4, 1877; F. W. Langdon.
(See also Group E of mounted birds.)

613. Aix sponsa (Linn.). WOOD DUCK; SUMMER DUCK. [587.] Whole of temperate North America; Cuba; accidental in Europe.

b. No. 84724. ♀ ad. Mount Carmel, Illinois, October 14, 1869; R. Ridgway.
(See also Group E of mounted birds.)

614. Fulix marila (Linn.). SCAUP DUCK. [588.] North America, breeding northward; portions of Palæarctic region.

615. Fulix affinis (Eyt.). LITTLE BLACKHEAD. [589.] North America, breeding in high latitudes.

a. No. 84729. ♀ ad. Mount Carmel, Illinois, March 16, 1875; R. Ridgway.
b. No. 84727. ♂ ad. Florida (?); C. J. Maynard.

616. Fulix collaris (Donov.). RING-BILLED BLACKHEAD; RING-NECK. [590.] North America, breeding northward.

a. No. 74536. ♂ ad. Northern Indiana; Cuvier Club, Cincinnati, Ohio.
b. No. 74537. ♀ ad. Northern Indiana; Cuvier Club, Cincinnati, Ohio.

616.* Fuligula rufina (Pall.). RUFOUS-CRESTED DUCK. Portions of Palæarctic region; accidental in Eastern North America (Long Island Sound).

617. Æthyia vallisneria (Wils.). CANVAS-BACK. [592.] North America, breeding northward.

a. No. 84732. ♀ ad. Mount Carmel, Illinois; March 10, 1875; C. W. Ridgway.
(See also Group E of mounted birds.)

618. Æthyia americana (Eyt.). REDHEAD. [591.] North America, breeding chiefly north of the United States.

(See Group E of mounted birds.)

619. Clangula islandica (Gmel.). BARROW'S GOLDEN-EYE.
[594.] Northern North America, including Greenland; south to Northern United States in winter; in Rocky Mountains, breeding south to Colorado; Iceland; accidental in Europe.

a. No. 63019. ♂ ad. Provo, Utah, November 11, 1872; Yarrow and Henshaw.

b. No. 84735. ♀ ad. Cambridge, Massachusetts, January, 1872; W. Brewster.

620. Clangula glaucium americana (Bp.). AMERICAN GOLDEN-EYE. [593.] North America, breeding from extreme Northeastern United States (Maine, &c.) northward.

a. No. 85484. ♂ ad. Mount Carmel, Illinois, January 18, 1874; S. Turner.

b. No. 85486. ♀ ad. Mount Carmel, Illinois, January 22, 1874; S. Turner.

621. Clangula albeola (Linn.). BUTTERBALL; BUFFLEHEAD.
[595.] North America in general, breeding far northward.

a. No. 74541. ♂ ad. Northern Indiana; Cuvier Club, Cincinnati, Ohio.

b. No. 84738. ♀ ad. Mount Carmel, Illinois, March 15, 1875; R. Ridgway.

622. Histrionicus minutus (Linn.). HARLEQUIN DUCK. [596.] Northern part of northern hemisphere; in America, south in winter to Middle States, Illinois, and California; breeding south to about 38° in Rocky Mountains and Sierra Nevada.

a. No. 62535. ♀ ad. Pribylov Island, Alaska, June 21, 1872; H. W. Elliott.

(See also Group G of mounted birds.)

623. Harelda glacialis (Linn.). LONG-TAILED DUCK; OLD SQUAW. [597.] Northern portions of northern hemisphere; chiefly littoral, and breeding far northward.

* *a.* No. 88185. ♂ ad. Winter, Stamford, Connecticut; Dr. R. W. Shufeldt, U. S. A.

b. No. 76197. ♂ ad. Summer, Cumberland Sound; L. Kumlien.

c. No. 88947. ♂ pullus. Point Barrow, Alaska, July 20, 1882; J. Murdoch.

624. Camptolæmus labradorius (Gmel.). LABRADOR DUCK.
[600.] Formerly, Northern Atlantic coast of North America, south in winter to New Jersey; said to have been obtained a few years since in Michigan, but believed to be now nearly, if not quite, extinct.

625. Cosmonetta stelleri (Pall.). STELLER'S DUCK. [598.] Arctic and subartic coasts of northern hemisphere; in Alaska, south to Kodiak and Unalashka.

a. No. 88945. ♀ ad. Point Barrow, Alaska, June 18, 1882; J. Murdoch.

(See also Group G of mounted birds.)

626. Lampronetta fischeri (Brandt). SPECTACLED EIDER. [599.] Coast of Alaska, from Norton Sound to Point Barrow.

b. No. 75887. ♂ juv. Alaska; E. W. Nelson.
c. No. 75889. ♀ ad. Alaska; E. W. Nelson.

(See also Group G of mounted birds.)

627. Somateria mollissima (Linn.). COMMON EIDER. Northern portions of Palæarctic region; also, Greenland and western shores of Cumberland Gulf.

a. No. 76171. ♂ ad. Cumberland Gulf, June 23, 1878; L. Kumlien.
b. No. 76177. ♂ juv. Cumberland Gulf, June 23, 1878; L. Kumlien.
c. No. 88558. Pullus. Dr. Hoadley.

627a. Somateria mollissima dresseri (Sharpe). AMERICAN EIDER. [606.] Coast of Labrador, and southward to Newfoundland and Northern Maine.

a. No. 17015. ♂ ad. Newfoundland; H. Drouet.
b. No. 18206. ♀ ad. Groswater Bay, Labrador; Dr. E. Coues.

628. Somateria v-nigrum Gray. PACIFIC EIDER. [607.] Coast of Alaska, north of the peninsula, and east to McKenzie River; portions of Eastern Siberia.

a. No. 75872. ♂ ad. Alaska; E. W. Nelson.
b. No. 73388. ♀ ad. Alaska; E. W. Nelson.

629. Somateria spectabilis (Linn.). KING EIDER. [608.] Circumpolar regions; in North America, south in winter to the Great Lakes and coast of California.

b. No. 76193. ♂ juv. Wejat Sound, Greenland; L. Kumlien.
**c*. No. 88967. ♀ ad. Point Barrow, Alaska, May 26, 1882; J. Murdoch.
d. No. 88964. ♀ ad. Point Barrow, Alaska, May 21, 1882; J. Murdoch.

630. Œdemia americana (Sw. & Rich.). AMERICAN SCOTER. [604.] Northern sea-coasts and larger inland waters of North America; south in winter to New Jersey, the Great Lakes, northern tributaries of the Ohio and Upper Mississippi, and coast of California; in summer south to higher mountains in Colorado.

a. No. 18883. ♂ ad. Newfoundland; H. Drouet.
b. No. 75866. ♀ ad. Alaska; E. W. Nelson.

[**631.**] **Melanetta fusca** (Linn.). VELVET SCOTER. Palæarctic region; accidental in Greenland.

632. Melanetta velvetina (Cass.). AMERICAN VELVET SCOTER. [601.] Coasts and larger inland waters of Northern North America; south in winter to Chesapeake Bay, the Great Lakes, and Southern California.

a. No. 46254. ♂ ad. Sitka, Alaska; F. Bischoff.

633. Peliometta perspicillata (Linn.). SURF DUCK. [602, 603.] Northern North America; south in winter to Jamaica, Ohio River, and Lower California. (Chiefly littoral.)

a. No. 84744. ♂ ad. Santa Cruz Island, California, March, 1878; W. A. Cooper.
b. No. 46261. ♀ ad. Sitka, Alaska; F. Bischoff.

634. Erismatura rubida (Wils.). RUDDY DUCK. [609.] Temperate North America; south in winter to New Granada and West Indies.

a. No. 84746. ♂ ad. Neosho Falls, Kansas, summer, 1872; G. Turner.
b. No. 59929. ♀ ad. Fort Tejon, California; J. Xantus.

635. Nomonyx dominicus (Linn.). BLACK MASKED DUCK. [610.] Tropical America; accidental in Eastern United States (Lake Champlain, New York, and Lake Koshkonong, Wisconsin).

a. No. 58818. ♂ ad. Tepic, Mexico; Col. A. J. Grayson.
b. No. 50865. ♀ ad. Tepic, Mexico; Col. A. J. Grayson.

636. Mergus merganser americanus (Cass.). AMERICAN SHELDRAKE. [611.] Whole of North America, breeding south to northern border of United States.

a. No. 84747. ♂ ad. Riverdale, Illinois, April, 1875; E. W. Nelson.
b. No. 84748. ♀ ad. Riverdale, Illinois, March, 1875; E. W. Nelson.

637. Mergus serrator Linn. RED-BREASTED SHELDRAKE. [612.] Northern hemisphere, breeding in cold-temperate and subarctic districts.

a. No. 9882. ♂ ad. San Francisco, California; Dr. A. D. Heermann.
b. No. 84749. ♀ ad. Cambridge, Massachusetts; W. Brewster.

638. Lophodytes cucullatus (Linn.). HOODED SHELDRAKE. [613.] Whole of North America, south to Mexico and Cuba; north to Alaska, and, accidentally, Greenland; Bermudas; casual in Europe. (Breeds nearly throughout its range.)

b. No. 1306. ♂ ad. Carlisle, Pennsylvania, March 21, 1844; Prof. S. F. Baird.

Order STEGANOPODES.—The Totipalmate Swimmers.

Family TACHYPETIDÆ.—The Frigate Pelicans.

639. Tachypetes aquila Linn. Frigate Pelican; Man-o-war Hawk. [619.] Tropical and subtropical seas in general, but chiefly north of the equator; north to California, Texas, Florida, and (casually) Long Island.

a. No. 78455. Ad. Big Pass, Florida, September 2, 1879; Col. S. T. Walker.

b. No. 59787. ♀ ad. Tehuantepec, November 18, 1869; Prof. F. Sumichrast.

c. No. 87940. Juv. Charlotte Harbor, Florida; J. Bell.

Family PELECANIDÆ.—The Pelicans.

640. Pelecanus erythrorhynchus Gmel. American White Pelican. [615.] North America, except arctic districts; rare along Atlantic coast, but in the interior, north to about 61°; south to Central America.

a. No. 78260. ♂ ad. Cameron Parish, Louisiana, January 12, 1879; C. K. Worthen.

641. Pelecanus fuscus Linn. Brown Pelican. [616.] Coasts of tropical and subtropical America (except Pacific side of South America); north to California and North Carolina; accidental in Illinois (?).

a. No. 80944. Ad., winter plumage. Saint Eustatius, West Indies; F. A. Ober.

b. No. 84755. ♂ juv. Florida; C. J. Maynard.

Family PHALACROCORACIDÆ.—The Cormorants.

642. Phalacrocorax carbo (Linn.). Common Cormorant. [620.] Various parts of eastern hemisphere and northern Atlantic coast of North America; south, in winter, to coast of New Jersey.

a. No. 2003. Ad., summer plumage.

643. Phalacrocorax dilophus (Sw. & Rich.). Double-crested Cormorant. [623.] Eastern North America, breeding northward.

a. No. 84756. ♂ ad. Mount Carmel, Illinois, September 28, 1874; S. Turner.

b. No. 41686. Juv. Boar's Head, New Hampshire, December 4, 1860; C. Perkins.

643a. Phalacrocorax dilophus floridanus (Aud.). FLORIDA CORMORANT. [624.] Eastern North America, breeding southward (Florida and Gulf States).

a. No. 84758. ♂ ad. Florida, spring; C. J. Maynard.

643b. Phalacrocorax dilophus cincinnatus (Brandt). WHITE-CRESTED CORMORANT. [622.] Northwest coast of North America; south to Oregon and (in winter) Nevada.

a. No. 77599. ♂ ad. Pyramid Lake, Nevada, May 26, 1877; H. W. Henshaw.

b. No. 75917. Juv. Saint Michael's, Alaska; E. W. Nelson.

643c. Phalacrocarax dilophus albociliatus Ridgw. LESSER WHITE-CRESTED CORMORANT. Coast of California, from Farallone Islands to Cape Saint Lucas; Revillegigedo Islands.

644. Phalacrocorax mexicanus (Brandt). MEXICAN CORMORANT. [625.] Mexico, Cuba, and Gulf States; north, in Mississippi Valley, to Eastern Kansas and Southern Illinois.

a. No. 28153. Ad. Cuba or Texas; G. N. Lawrence.

b. No. 58809. ♀ juv. Mazatlan, Mexico; Col. A. J. Grayson.

645. Phalacrocorax penicillatus (Brandt). BRANDT'S CORMORANT. [626.] Pacific coast of United States (Columbia River to Cape Saint Lucas).

a. No. 84759. ♂ ad. Farallone Islands, California, summer; F. Gruber.

646. Phalacrocorax violaceus (Gmel.). VIOLET-GREEN CORMORANT. [627.] Coasts and islands of the North Pacific, from Kamtschatka, Commander and Kurile Islands, and Alaska, south to British Columbia and Vancouver Island.

a. No. 46487. Ad. Saint Michael's, Alaska, June 15, 1866; C. Pease.

b. No. 81229. Juv. Saint Michael's, Alaska; E. W. Nelson.

c. No. 38660. Pullus. Neeah Bay, Washington Territory; J. G. Swan.

646a. Phalacrocorax violaceus resplendens (Aud). BAIRD'S CORMORANT. Pacific coast of United States, south to Mazatlan.

a. No. 23884. Ad. Mazatlan, Mexico, summer; J. Xantus.

647. Phalacrocorax bicristatus Pall. RED-FACED CORMORANT. Prybilov (Seal) Islands, Aleutian Chain, Kuriles, and coast of Kamtschatka; said to occur casually in Japan and Formosa.

a. No. 62648. ♀ ad. Saint Paul's Island, Alaska, May 29, 1872; H. W. Elliott

647. Phalacrocorax bicristatus—Continued.

b. No. 68350. Juv. Prybilov Islands, Alaska; Lieut. G. R. Adams, U. S. N.

c. No. 62533. Pullus. Saint Paul's Island, Alaska, July 2, 1872; H. W. Elliott.

648. Phalacrocorax perspicillatus Pall. PALLAS'S CORMORANT. [621.] Bering Island (extinct?).

Family PLOTIDÆ.—The ANHINGAS.

649. Plotus anhinga Linn. AMERICAN ANHINGA; SNAKE BIRD. [628.] Whole of tropical America; Gulf States, and north in Mississippi Valley to Southern Illinois.

a. No. 84760. ♂ ad., nuptial plumage. Florida, spring, 1874; J. C. Scholl.

(See also Group H of mounted birds.)

Family SULARIDÆ.—The GANNETS.

650. Sula bassana (Linn.). GANNET. [617.] Coasts and islands of the North Atlantic; south, in winter, to Gulf of Mexico.

a. No. 12853. Ad. New York; J. G. Bell.

651. Sula cyanops Sundev. BLUE-FACED GANNET. Coasts and islands of the South Pacific and various intertropical seas; Bahamas and South Florida.

a. No. 67315. Ad. Christmas Island; Dr. T. H. Streets, U. S. N.

b. No. 67316. ♂ juv. Christmas Island; Dr. T. H. Streets, U. S. N.

652. Sula leucogastra (Bodd.). BOOBY GANNET. [618.] Coasts of tropical and subtropical America (on both sides), north to Georgia.

a. No. 24152. Ad. (?). Brazil; L. Wells.

b. No. 30356. ♂ juv. Spanishtown, Jamaica; W. T. March.

653. Sula piscator (Linn.). RED-FOOTED BOOBY. Intertropical seas and coasts, north to Florida and Revillegigedo Islands.

a. No. 50867. ♂ ad. Socorro Island; Col. A. J. Grayson.

b. No. 67332. Juv. Near Sandwich Islands; Dr. T. H. Streets, U. S. N.

Family PHAËTHONTIDÆ.—The TROPIC BIRDS.

654. Phaëthon flavirostris (Brandt.) YELLOW-BILLED TROPIC BIRD. [629.] Tropical seas in general; north, regularly, to Florida, accidentally to New York.

a. No. 77857. ♀ ad. Dominica, West Indies; F. A. Ober.

655. Phaëthon æthereus Linn. RED-BILLED TROPIC BIRD. Tropical seas; north to Gulf of California, West Indies, and, casually, to Newfoundland Banks.

a. No. 74033. ♂ ad. Saint Vincent, West Indies; F. A. Ober.
b. No. 89947. Juv. Saint Eustatius, West Indies; F. A. Ober.

Order GAVIÆ.—The GULL-LIKE SWIMMERS.

Family RHYNCHOPSIDÆ.—The SKIMMERS.

656. Rhynchops nigra Linn. BLACK SKIMMER. [697.] Sea-coasts of tropical and warm-temperate America; north along Atlantic coast of United States to New Jersey and (casually) to Maine.

**a*. No. 89269. ♂ ad. Cobb's Island, Virginia, July, 1880; R. Ridgway.
**b*. No. 80248. ♀ ad. Cobb's Island, Virginia, July, 1880; R. Ridgway.
**c*. No. 80249. Pullus. Bone Island, Virginia, July, 1880; R. Ridgway.

Family LARIDÆ.—The GULL TRIBE.

657. Pagophila eburnea (Phipps). IVORY GULL. [676, 677.] Circumpolar regions; south, in winter, along Atlantic coast of North America to Newfoundland and New Brunswick.

a. No. 76236. ♀ juv. Cumberland Gulf, 1877; L. Kumlien.

658. Rissa tridactyla (Linn.). KITTIWAKE GULL. [672.] Coasts and islands of North Atlantic; south, in winter, to Middle States and Great Lakes.

**a*. No. 79134. ♂ ad. Davis Straits, July 26, 1879; N. P. Scudder.
b. No. 79138. ♀ juv. Davis Straits, August 16, 1879; N. P. Scudder.

658a. Rissa tridactyla kotzebuei (Bp.). PACIFIC KITTIWAKE. North Pacific Ocean, including islands and coasts of Alaska; west to Kamschatka and Commander Islands, north to the Arctic Ocean.

659. Rissa brevirostris (Brandt). RED-LEGGED KITTIWAKE. [674, 675.] Shores and islands of North Pacific (on both sides); in Alaska, throughout Aleutian chain and on Prybilov Islands.

**a*. No. 64371. ♂ ad. Saint George's Island, Alaska; H. W. Elliott.
**b*. No. 64365. ♀ ad. Saint George's Island, Alaska; H. W. Elliott.
c No. 73149. ♀ juv. Saint Michael's, Alaska, September 18, 1876; L. M. Turner.

660. Larus glaucus Brünn. GLAUCOUS GULL; BURGOMASTER. [656.] Circumpolar regions; south in winter to Long Island, the Great Lakes, and coast of Southern Alaska.

a. No. 76211. ♂ ad. Cumberland Gulf, June 6, 1878; L. Kumlien.
b. No. 76209. ♂ juv. Cumberland Gulf, 1877; L. Kumlien.
c. No. 79132. ♀ juv. Davis Straits, August 15, 1879; N. P. Scudder.

661. Larus leucopterus Faber. WHITE-WINGED GULL. [658.] With much the same range as L. glaucus.

a. No. 71024. Juv. Cumberland Gulf, August 30, 1876; Lieut. W. A. Mintzer, U. S. N.

662. Larus glaucescens Licht. GLAUCOUS-WINGED GULL. [657, 659] North Pacific coast; south, in winter, to Oregon; Cumberland Gulf.

a. No. 54680. ♂ ad. Kodiak, Alaska; F. Bischoff.
b. No. 73399. ♀ juv. Unalashka Island, Alaska, May 10, 1877; E. W. Nelson.

663. Larus marinus Linn. GREAT BLACK-BACKED GULL. [660.] Coasts of North Atlantic; south, in winter, to Long Island and the Great Lakes; Arctic Ocean, north of Bering's Straits; and occasional on Alaskan coast of Bering Sea; Japan.

a. No. 18214. ♀ ad. Groswater Bay, Labrador, August 10; Dr. E. Coues.
b. No. 18215. Juv. Henley Harbor, Labrador, September 2; Dr. E. Coues.
c. No. 84765. Pullus. Labrador; presented by R. Ridgway.

664. Larus occidentalis Aud. WESTERN GULL. [662.] Pacific coast of United States, south to Cape Saint Lucas.

a. No. 86397 ♀ ad. La Paz, Lower California, February 15, 1882; L. Belding.
b. No. 72739. ♂ juv. Santa Cruz Island, California, June 9, 1875; H. W. Henshaw.

665. Larus affinis Reinh. SIBERIAN GULL. Northern portions of Palæarctic region; accidental in (and originally described from) Greenland.

666. Larus argentatus Brünn. HERRING GULL. Palæarctic region; casual or occasional in Eastern North America.

666a. Larus argentatus smithsonianus Coues. AMERICAN HERRING GULL. [661.] North America in general, but rare on Pacific coast, and breeding northward.

666a. Larus argentatus smithsonianus—Continued.

a. No. 84767. ad., winter. Fire Island, New York; J. H. Batty.
b. No. 84769. ♀ juv. Long Island New York; J. H. Batty.
c. No. 20807. Pullus. Fort George, Hudson's Bay Territory, July 5, 1860; C. Drexler.

667. Larus cachinnans Pall. PALLAS'S HERRING GULL. Northern Asia and North Pacific coast of North America, south in winter to California.

668. Larus californicus Lawr. CALIFORNIAN GULL. [663.] Western North America, chiefly in the interior; north to Alaska, south to Western Mexico.

a. No. 77552. ♀ ad. Pyramid Lake, Nevada, May 26, 1877; H. W. Henshaw.
b. No. 72731. ♂ juv. Washoe Lake, Nevada, August 31, 1876; H. W. Henshaw.
c. No. 77583. ♂ *pullus*. Eagle Lake, California, July 4, 1877; H. W. Henshaw.

669. Larus delawarensis Ord. RING-BILLED GULL. [664.] North America in general, breeding northward.

a. No. 77312. ♀ ad. Hernando County, Florida, March 10, 1876; Greene Smith.
b. No. 65529. Juv. La Riviere Lac, Dakota Territory, September 13, 1873; Dr. E. Coues, U. S. A.

670. Larus brachyrhynchus Rich. SHORT-BILLED GULL. [664 *a*, 665, 673.] Northwestern North America, south in winter to Washington Territory.

a. No. 73402. Ad. Alaska; E. W. Nelson.
b. No. 75934. Juv. Alaska; E. W. Nelson.

671. Larus canus Linn. MEW GULL. Palæarctic region; casual (?) in Labrador.

672. Larus heermanni Cass. HEERMANN'S GULL. [666.] Pacific coast of North America, from British Columbia to Panama.

a. No. 72740. ♂ ad. Santa Barbara, California, June 24, 1875; H. W. Henshaw.
b. No. 86400. ♀ juv. La Paz, Lower California, January 4, 1882; L. Belding.

673. Larus atricilla Linn. LAUGHING GULL. [667.] Atlantic coast, from Maine (casually) to mouth of the Amazon, breeding north to New Jersey; Pacific coast of Central America in winter, casual in Europe.

a. No. 80213. ♂ ad. Cobb's Island, Virginia, July 12, 1880; R. Ridgway.

(See also Group I of mounted birds.)

674. Larus franklini Sw. & Rich. FRANKLIN'S GULL. [668, 669.] Interior of North America, breeding chiefly north of the United States; in winter throughout Central and a considerable portion of South America.

675. Larus philadephiæ (Ord.). BONAPARTE'S GULL. [670.] North America in general, but not south of the United States (?); Bermudas; breeding far northward.

a. No. 84774. ♀ ad. San Pablo Bay, California, January 23, 1880; C. A. Allen.

676. Rhodestethia rosea (Macgill.). ROSS'S GULL. [678.] Arctic Ocean, extending, rarely, south to Disco Bay and Northern Alaska; accidental in Heligoland, Färoes, England (Yorkshire), and Kamtschatka.

677. Xema sabinei (J. Sabine). SABINE'S GULL. [680.] Circumpolar; south in winter to Maine, New York, the Great Lakes, Great Salt Lake, and, casually, to the Bermudas and Peru.

(See Group I of mounted birds.)

678. Creagrus furcatus (Neb.). SWALLOW-TAILED GULL. [679.] Pacific coast of South America (Peru to Galapagos); Monterey, California???

679. Sterna anglica Montag. GULL-BILLLED TERN. [681.] Atlantic coast of United States, south in winter to Southern Mexico; also various parts of the Old World, including Australia.

a. No. 80135. ♀ ad. Bone Island, Virginia, July 13, 1880; R. Ridgway.

680. Sterna caspia Pall. CASPIAN TERN. [682.] Coasts and various inland waters of North America, breeding, in isolated localities, throughout its range, or from Texas to near the arctic coast; also many portions of the eastern hemisphere, including Australia.

a. No. 76772. ♂, winter. Shore of California; F. Gruber.

681. Sterna regia Gamb. ROYAL TERN. [683.] Coasts and various inland waters of Southern North America, breeding north to about 40°.

**a*. No. 80110. ♂ ad. Cobb's Island, Virginia, July 3, 1880; R. Ridgway.

682. Sterna elegans Gamb. ELEGANT TERN. [684.] Pacific coast of Middle America, north to Southern California.

a. No. 51434. ♂ ad. Mazatlan, Mexico, March, 1868; F. Bischoff.

683. Sterna cantiaca acuflavida (Cabot.). CABOT'S TERN. [685.] Both coasts of Middle America (in winter), north to Atlantic coast of United States.

a. No. 58935. Ad. Tehuantepec, Mexico, February 21, 1869; F. Sumichrast.

684. Sterna trudeaui Aud. TRUDEAU'S TERN. [687.] Atlantic coast of South America; casual along Atlantic coast of United States (New Jersey).

685. Sterna forsteri Nutt. FORSTER'S TERN. [691, 686.] Whole of temperate North America, breeding, in suitable localities, throughout its range; in winter, south to Brazil.

**a*. No. 80148. ♂ ad. Cobb's Island, Virginia, July 9, 1880; R. Ridgway.

**b*. No. 89258. ♀ ad. Cobb's Island, Virginia, July 9, 1880; R. Ridgway.

686. Sterna fluviatilis Naum. COMMON TERN. [689.] Eastern temperate North America and various portions of the Old World; accidental (?) southwest to Arizona.

a. No. 80182. ♀ ad. Cobb's Island, Virginia, July 12, 1880; R. Ridgway.

**b*. No. 80307. ♂ juv. Bone Island, Virginia, July 16, 1880; P. L. Jouy.

687. Sterna macrura Naum. ARCTIC TERN. [690, 693.] Circumpolar regions, south in winter to Middle States and California; on Atlantic coast, breeding south to Massachusetts.

**a*. No. 70244. ♂ ad. Saint Michael's, Alaska; L. M. Turner.

**b*. No. 75977. Juv. Saint Michael's, Alaska; E. W. Nelson.

688. Sterna dougalli Montag. ROSEATE TERN. [692.] Atlantic coast of United States, West Indies, and various parts of eastern hemisphere, including Australia.

a. No. 84778. ♂ ad. Nantucket, Massachusetts, June 30, 1874; W. Brewster.

b. No. 84779. ♀ ad. Nantucket, Massachusetts, June 30, 1874; W. Brewster.

689. Sterna aleutica Baird. ALEUTIAN TERN. Eastern Aleutian Islands, and northward to, or beyond, Norton Sound.

**a*. No. 70234. ♂ ad. Saint Michael's, Alaska; L. M. Turner.

b. No. 89268. Juv. Saint Michael's, Alaska; E. W. Nelson.

690. Sterna antillarum Less. LEAST TERN. [694.] United States (rather southern), Middle America, and West Indies, breeding in suitable localities north to, or beyond, 40°.

*a. No. 80194. ♀ ad. Bone Island, Virginia, July, 1880; R. Ridgway.
*b. No. 80199. Juv. Bone Island, Virginia, July, 1880; R. Ridgway.
*c. No. 80205. Pullus. Bone Island, Virginia, July, 1880; R. Ridgway.

691. Sterna fuliginosa Gmel. SOOTY TERN. [688.] Sea-coasts throughout the warmer parts of the world; in North America, along the Gulf and South Atlantic coasts, north, casually, to, or beyond, Pennsylvania.

*a. No. 12837. Ad. Tortugas, Florida, July 4, 1859; Dr. Whitehurst.

692. Sterna anæstheta Scop. BRIDLED TERN. Intertropical sea-coasts; casual (?) on Florida coast.

693. Hydrochelidon lariformis surinamensis (Gmel.). BLACK TERN. [695.] Temperate North America in summer; south, in winter, to West Indies; South America as far as Chili.

*a. No. 77561. ♂ ad. Washoe Lake, Nevada, June 4, 1877; H. W. Henshaw.
*b. No. 64046. ♀ ad. Pembina, Dakota, June 17, 1873; Dr. E. Coues, U. S. A.
*c. No. 59745. ♀ ad., winter plumage. Tehuantepec, Mexico, August 9, 1869; F. Sumichrast.
*d. No. 15793. Juv. Mazatlan, Mexico; Col. A. J. Grayson.

694. Hydrochelidon leucoptera (Weisn. & Schinz.). WHITE-WINGED BLACK TERN. Palæarctic region; accidental in Eastern North America (Lake Koshkonong, Wisconsin).

695. Anous stolidus (Linn.). NODDY TERN. [696.] Intertropical seas; also South Atlantic and Gulf coasts of United States.

*a. No. 11899. Ad. Garden Key, Tortugas, Florida, April 30, 1859; Capt. D. P. Woodberry.

Family STERCORARIIDÆ.—The SKUA GULLS.

696. Megalestris skua (Brünn.). SKUA GULL. [652.] Northern seas and coasts of northern hemisphere; in winter, south to Massachusetts and California. (Rare on Pacific side?)

697. Stercorarius pomatorhinus (Temm.). POMARINE JAEGER. [653.] Northern portions of northern hemisphere, chiefly maritime; in North America south in winter to New Jersey and the Great Lakes.

a. No. 88895. ♀ ad. Point Barrow, Alaska, June 24, 1882; J. Murdoch.

b. No. 81219. Ad. Saint Michael's, Alaska; E. W. Nelson.

698. Stercorarius parasiticus (Linn.). RICHARDSON'S JAEGER. [654.] Northern parts of northern hemisphere, south in winter to New York, Illinois, Colorado (!), and even to coast of Brazil.

a. No. 88896. ♀ ad. Point Barrow, Alaska, July 5, 1882; J. Murdoch.

b. No. 79056. ♀ ad. South Greenland; Governor Fencker.

c. No. 52511. ♂ ad., melanistic phase. Kodiak, Alaska, May 24, 1868; F. Bischoff.

699. Stercorarius longicaudus Vieill. LONG-TAILED JAEGER. [655.] Circumpolar regions; south in winter to northern United States.

a. No. 88904. ♀ ad. Point Barrow, Alaska, June 27, 1882; J. Murdoch.

Order TUBINARES.—The TUBE-NOSED SWIMMERS.

Family DIOMEDEIDÆ.—The ALBATROSSES.

700. Diomedea nigripes Aud. BLACK-FOOTED ALBATROSS. Pacific coast of North America.

a. No. 76853. Ad. (?) Coast of California; A. L. Heermann.

701. Diomedea brachyura Temm. SHORT-TAILED ALBATROSS. [631.] North Pacific Ocean, south to coast of Oregon.

a. No. 68346. Ad. Bering Sea; Lieut. G. R. Adams, U. S. N.

701.* Diomedea melanophrys Temm. SPECTACLED ALBATROSS. Southern oceans, especially South Pacific; casual off coast of California.

a. No. 21297. Ad. Pacific Ocean; Dr. Stuart.

[**702.**] **Diomedea culminata** Gould. YELLOW-NOSED ALBATROSS. [632.] Pacific Ocean; accidental off coast of Oregon.

703. Phœbetria fuliginosa (Gmel.). SOOTY ALBATROSS. [633.] Southern oceans; north, casually (?) to coast of Oregon.

a. No. 68953. ♀ ad. Kerguelen Island; Dr. J. H. Kidder, U. S. N.

Family PROCELLARIIDÆ.—The PETRELS.

704. Ossifraga gigantea (Gm.). GIANT FULMAR. [634.] Southern oceans; north to coast of Oregon.

705. Fulmarus glacialis (Linn.). FULMAR PETREL. [635.] North Atlantic; south, in winter, to Massachusetts.

a. No. 79119. ♂ ad. Davis Straits, July 19, 1879; N. P. Scudder.

705a. Fulmarus glacialis pacificus (Aud.) PACIFIC FULMAR. [636.] North Pacific; south, in winter, to coast of Western Mexico.

a. No. 33119. Ad., light phase. North Pacific; Dr. W. Stimpson.
b. No. 33121. Ad., dark phase. Sea of Kamtschatska; Dr. W. Stimpson.

705b. Fulmarus glacialis rodgersi (Cass.). RODGERS'S FULMAR. North Pacific, from Japan to Alaska.

a. No. 64348. ♂ ad. Saint George's Island, Alaska; H. W. Elliott.

706. Priocella tenuirostris (Aud.). SLENDER-BILLED FULMAR. [637.] Southern seas and Pacific coast of North America (common off mouth of Columbia River).

a. No. 33122. Ad. South Africa; Dr. Stuart.

707. Priofinus melanurus (Bonn.). BLACK-TAILED SHEARWATER. South Pacific; north, casually (?), to coast of California.

a. No. 21312. Ad. Cape of Good Hope; Dr. Stuart.

708. Puffinus kuhli (Boie). CINEREOUS SHEARWATER. [651.] Middle Atlantic, but chiefly the eastern side.

(See Group J. of mounted birds.)

708.* Puffinus borealis Cory. NORTHERN SHEARWATER. Off coast of Massachusetts.

709. Puffinus major Faber. GREATER SHEARWATER. [647.] Atlantic Ocean generally.

**a*. No. 79922. ♂ ad. Newfoundland Banks, July 30; Capt. J. W. Collins.

710. Puffinus creatopus Cooper. PINK-FOOTED SHEARWATER. Pacific coast, from California to Chili.

711. Puffinus anglorum Temm. MANX SHEARWATER. [649.] North Atlantic, particularly the eastern side; Mediterranean Sea; "Coast of New Jersey to Labrador." (?)

712. Puffinus auduboni Finsch. DUSKY SHEARWATER. [650.] Warmer portions of Atlantic Ocean, north to New Jersey.

a. No. 80978. ♂ ad. Saba, West Indies; F. A. Ober.

713. Puffinus gavia (Forst.) BLACK-VENTED SHEARWATER. South Pacific, from New Zealand to Lower California.

714. Puffinus fuliginosus Strickl. SOOTY SHEARWATER. [648.] North Atlantic, south to North Carolina.

(See Group J of mounted birds.)

715. Puffinus griseus (Gm.). DARK-BODIED SHEARWATER. South Pacific, north to Lower California.

716. Puffinus tenuirostris Temm. SLENDER-BILLED SHEARWATER. North Pacific.

717. Œstrelata hæsitata (Temm.). BLACK-CAPPED PETREL. [638.] Warmer parts of Atlantic Ocean, straggling north to Florida, New York, France, and England. Sandwich Islands?

717.* Œstrelata fisheri Ridgw. FISHER'S PETREL. Coast of Alaska; accidental in Western New York?

718. Œstrelata bulweri (Jard. & Selby). BULWER'S PETREL. Eastern middle Atlantic, especially in vicinity of Canary Islands; accidental near Greenland.

719. Daption capensis (Linn.). PINTADO PETREL; CAPE PIGEON. [639.] Southern seas; accidental (?) off coast of California.

a. No. 89434. Ad. Falkland Islands, April 30, 1882; Dr. T. C. Craig, U. S. N.

720. Halocyptena microsoma Coues. LEAST PETREL. Coast of Lower California.

721. Procellaria pelagica Linn. STORMY PETREL; MOTHER CAREY'S CHICKEN. [645.] North Atlantic, south to Newfoundland Banks.

722. Oceanites oceanicus (Kuhl). WILSON'S PETREL. [644.] Atlantic Ocean, Australian seas, and other regions; Gulf of Mexico to Baffin's Bay.

723. Cymochorea leucorrhoa (Vieill.). LEACH'S PETREL. [642.] Seas of northern hemisphere; Massachusetts to Baffin's Bay.

(See Group J of mounted birds.)

724. Cymochorea melæna (Bp.). BLACK PETREL. [643.] South Pacific, north to Lower California.

725. Cymochorea homochroa Coues. ASHY PETREL. Farallone Islands, coast of California.

726. Oceanodroma furcata (Gmel.). FORK-TAILED PETREL. [640.] North Pacific, south to coast of Oregon.

(See Group J of mounted birds.)

727. Oceanodroma hornbyi (Gray). HORNBY'S PETREL. [641.] North Pacific ("Russian America").

728. Fregetta grallaria (Vieill.). WHITE-BELLIED PETREL. [646.] Tropical seas, mostly in southern hemisphere; accidental off coast of Florida.

Order PYGOPODES.—The DIVERS.

Family PODICIPEDIDÆ.—The GREBES.

729. Æchmophorus occidentalis (Lawr.). WESTERN GREBE. [704.] Western North America, but chiefly the interior; north in summer to Manitoba, south in winter to Mexico.

a. No. 74470. ♂ ad. Stockton, California, June 3, 1878; L. Belding.

(See also Group K of mounted birds.)

730. Æchmophorus occidentalis clarki (Lawr.). CLARK'S GREBE. [705.] Pacific coast of North America, south in winter to Mexico.

a. No. 41243. Ad. San Pedro, California, November, 1865; Dr. E. Coues, U. S. A.

731. Podicipes holboelli Reinh. AMERICAN RED-NECKED GREBE. (702,703 *a*.] North America, including Greenland; in winter, throughout United States; Eastern Siberia.

a. No. 81281. Juv. Saint Michæl's, Alaska; E. W. Nelson.

732. Dytes auritus (Linn.). HORNED GREBE. [706.] Northern hemisphere, breeding in colder regions.

(See Group K of mounted birds.)

[733.] Dytes nigricollis (Sund.). EARED GREBE. [708.] Palæarctic region, including Southern Greenland.

733a. Dytes nigricollis californicus (Heerm.). AMERICAN EARED GREBE. [707.] Western North America, east (casually?) to Mississippi Valley.

(See Group K of mounted birds.)

734. Tachybaptes dominicus (Linn.). SAINT DOMINGO GREBE.
[708 *a*.] Whole of tropical America, including West Indies; north to Rio Grande Valley, in Texas, and Lower California.

a. No. 70597. ♂ ad. Santa Maria, Texas, March 2, 1876; Dr. J. C. Merrill.

735. Podilymbus podiceps (Linn.). THICK-BILLED GREBE.
[709.] Whole of tropical and temperate America.

a. No. 88537. ♂ juv. Wheatland, Indiana, October 19, 1882; R. Ridgway.
b. No. 65554. Pullus. Turtle, Mount Dakota, August 7, 1873; Dr. E. Coues, U. S. A.
(See also Group K of mounted birds.)

Family COLYMBIDÆ.—The LOONS or DIVERS.

736. Colymbus torquatus Brünn. LOON. [698.] Northern portions of northern hemisphere; in America, breeding south to northern border of the United States.

a. No. 68352. Ad. Potomac River, D. C.; S. Wolf.

737. Colymbus adamsi Gray. GREAT WHITE-BILLED LOON
Western Arctic America.

a. No. 44454. Ad. Fort Resolution, June, 1875; J. Lockhart.

738. Colymbus arcticus Linn. BLACK-THROATED DIVER.
[699.] Northern parts of northern hemisphere.

a. No. 76004. Ad. Alaska; E. W. Nelson.

739. Colymbus pacificus Lawr. PACIFIC DIVER. [700.] Pacific coast of North America, breeding far northward (chiefly in Alaska).

a. No. 88978. ♀ ad. Point Barrow, Alaska, July 4, 1882; M. Smith.

740. Colymbus septentrionalis Linn. RED-THROATED DIVER. [701.] Northern portions of northern hemisphere in America, south in winter nearly across the United States.

a. No. 76007. Ad. Saint Michael's, Alaska; E. W. Nelson.

Family ALCIDÆ.—The AUK TRIBE.

741. Plautus impennis (Linn.). GREAT AUK. [710.] Believed to be now extinct; formerly (previous to 1844) inhabiting the islands of the North Atlantic from the New England coast (Boston Bay) north to the Arctic Circle.

742. Alca torda Linn. RAZOR-BILLED AUK. [711.] Coast and islands of the North Atlantic, south in winter to about 40°; Japan.

(See Group L of mounted birds.)

743. Fratercula arctica (Linn.). COMMON PUFFIN. [715, 716.] Coasts and islands of Arctic and North Atlantic Oceans; south in winter to coasts of Massachusetts and France; in North America breeding south to Bay of Fundy.

a. No. 79026. ♀ ad. Godhavn, Greenland; Governor Fencker.

743a. Fratercula arctica glacialis (Leach). LARGE-BILLED PUFFIN. [714.]

744. Fratercula corniculata (Naum.). HORNED PUFFIN. [713.] Coasts and Islands of the North Pacific; south in winter to Sitka.

**a*. No. 54740. Ad. Kodiak, Alaska, July 29, 1868; F. Bischoff.

745. Lunda cirrhata (Pall.). TUFTED PUFFIN. [712.] North Pacific; along American coast, breeding south to Farallone Islands, California; said to have been taken on Kennebec River, Maine, and Bay of Fundy.

a. No. 81277. Juv. Saint Michael's, Alaska; E. W. Nelson.
b. No. 68320. Pullus. Alaska; Lieut. G. R. Adams, U. S. N.
(See also Group L of mounted birds.)

746. Ceratorhyncha occidentalis Bonap. HORNED-BILLED PUFFIN. [717,718.] Coasts and islands of the North Pacific; on the Asiatic side south to Japan and Kamtschatka, and on the American coast breeding south to San Diego, California.

(See Group L of mounted birds.)

747. Phaleris psittacula (Pall.). PARROT AUK. [725.] Shores and islands of the North Pacific, from Japan (?) and Kamtschatka to Sitka.

**a*. No. 64346. Ad. Saint George's Island, Alaska, July 12, 1872; H. W. Elliott.

748. Simorhynchus cristatellus (Pall.). CRESTED AUK. [719,720.] Coasts and islands of the North Pacific from Japan to Kodiak, and north to Prybilov (Seal) Islands.

**a*. No. 62565. Ad. Saint Paul's Island, April 16, 1872; H. W. Elliott

(See also Group L of mounted birds.)

749. Simorhynchus pygmæus (Gmel.). WHISKERED AUK. [721.] Commander Islands and coast of Kamtschatka; east through Aleutian chain to Unalashka.

(See Group L of mounted birds.)

750. Ciceronia pusilla (Pall.). LEAST AUK. [722,723.] Coasts and islands of the North Pacific from Northern Japan to Alaska; south in winter to Sitka.

*a. No. 62601. ♂ ad. Saint Paul's Island, April 23, 1872; H. W. Elliott.

*b. No. 62614. ♀ ad. Saint Paul's Island, April 23, 1872; H. W. Elliott.

(See also Group L of mounted birds.)

751. Ptycorhamphus aleuticus (Pall.). CASSIN'S AUK. [724.] Pacific coast of North America from Aleutian Islands to San Diego, California.

a. No. 61443. Ad. San Miguel Island, California.

752. Alle nigricans Link. SEA DOVE; DOVEKIE. [738.] North Atlantic; south, in winter, to New Jersey.

a. No. 85853. Ad. Greenland; Governor Fencker.

753. Synthliborhamphus antiquus (Gm.). BLACK-THROATED GUILLEMOT. [736.] North Pacific coast from Japan to Sitka.

(See Group L of mounted birds.)

754. Synthliborhamphus wurmizusume (Temm.). TEMMINCK'S GUILLEMOT. [737.] North Pacific coast from Japan to Washington Territory.

755. Brachyrhamphus marmoratus (Gm.). MARBLED GUILLEMOT. [732, 733.] Pacific coast of North America; south to Santa Cruz, California.

a. No. 78193. Ad., summer plumage. Santa Cruz, California; W. A. Cooper.

b. No. 78192. Ad., winter plumage. Santa Cruz, California; W. A. Cooper.

756. Brachyrhamphus kittlitzi Brandt. KITTLITZ'S GUILLEMOT. [735.] North Pacific coast from Japan to Unalashka.

757. Brachyrhamphus hypoleucus Xantus. XANTUS'S GUILLEMOT. Coast of California from San Diego to Cape Saint Lucas.

758. Brachyrhamphus craverii Salvad. CRAVER'S GUILLEMOT. Coast of Lower California.

759. Brachyrhamphus brachypterus Brandt. SHORT-WINGED GUILLEMOT. [734.] Unalashka.

760. Uria grylle (Linn.). BLACK GUILLEMOT. [726.] Coasts and islands of Arctic and North Atlantic Oceans; in America, south in winter to New Jersey; rare on coast of Alaska north of the peninsula.

a. No. 76309. ♀ ad. Cumberland Gulf; L. Kumlien.

761. Uria columba (Pall.). PIGEON GUILLEMOT. [727.] North Pacific (both sides), breeding south to California.

a. No. 62707. ♀ ad. Popoff Straits, Alaska, June 24, 1872; W. H. Dall.

762. Uria carbo (Pall.). SOOTY GUILLEMOT. [728.] Northern Japan to Unalashka.

763. Lomvia troile (Linn.). COMMON GUILLEMOT. [729, 730.] North Atlantic; in America, south in winter to coast of New England.

a. No. 517. ♂ ad. Labrador?; Prof. S. F. Baird.

763a. Lomvia troile californica (Bryant). CALIFORNIA GUILLEMOT. Pacific coast of North America, breeding south to Farallone Islands, California.

a. No. 64305. ♂ ad. Saint George's Island, Alaska, June 20, 1872; H. W. Elliott.

764. Lomvia arra (Pall.). THICK-BILLED GUILLEMOT. Northern parts of North Pacific; Bering's Sea.

a. No. 64309. Ad. Prybilov Islands, Alaska; H. W. Elliott.
b. No. 68334. Pullus. Walrus Island, Alaska; Lieut. G. R. Adams, U. S. N.

764a. Lomvia arra bruennichi (Schleg.). BRUENNICH'S GUILLEMOT. [731.] North Atlantic; south in winter to New Jersey; Arctic Ocean.

a. No. 71016. Ad. N. lat. 62° 24′, W. lon. 65°; Lieut. W. A. Mintzer, U. S. N.
b. No. 18255. Juv. Groswater Bay, Labrador, July 25; Dr. E. Coues.

MOUNTED GROUPS.

GROUP A.

1. American Bittern (497. *Botaurus lentiginosus*). No. 88175. ♂ ad. Omaha, Nebraska; Dr. R. W. Shufeldt, U. S. A.
2. Scarlet Ibis (502. *Eudocimus ruber*). No. 76762. ♂ ad. Brazil; J. G. Bell.
3. White-faced Glossy Ibis (504. *Plegadis guarauna*). No. 79167. ♂ ad. Stockton, California, May 7, 1879; L. Belding.

GROUP B.

1. Least Bittern (498. *Ardetta exilis*). No. 89890. ♂ ad. Gainesville, Florida, February, 1883; G. Shoemaker.
2. Louisiana Heron (492. *Hydranassa tricolor ludoviciana*). No. 84588. Juv. Florida; presented by R. Ridgway.
3. Little Blue Heron (493. *Florida cærulea*).
4. Roseate Spoonbill (505. *Ajaja rosea*). No. 68302. Ad. Florida; Prof. J. W. P. Jenks.

GROUP C.

1. Emperor Goose (598. *Philacte canagica*). No. 81232. Ad. Alaska; E. W. Nelson.
2. Black Brant (596. *Bernicla nigricans*). No. 88976. ♂ ad. Point Barrow, Alaska, June 18, 1882; J. Murdoch.

GROUP D.

1. Black-bellied Tree Duck (599. *Dendrocycna autumnalis*). No. 58974. ♂ ad. Isthmus Tehuantepec, June 15, 1869; Prof. F. Sumichrast.
2. Fulvous Tree Duck (600. *Dendrocycna fulva*). No. 77897. Ad. San Luis Obispo, California, April, 1879; Dr. W. W. Hays.

GROUP E.

1. Blue-winged Teal (609. *Querquedula discors*). No. 87711. ♂ ad. Gurnell, Illinois, April 12, 1881; H. K. Coale.
2. Cinnamon Teal (610. *Querquedula cyanoptera*). No. 89901. ♂ ad. Colorado, autumn.
3. Green-winged Teal (612. *Nettion carolinensis*). No. 84722. ♂ ad. Mount Carmel, Illinois, March 25, 1877; J. L. Ridgway.

4. CANVAS-BACK (617. *Æthyia vallisneria*). No. 9778. ♂ ad. San Francisco, California; Dr. A. L. Heermann.
5. RED-HEAD (618. *Æthyia americana*). No. 89900. ♂ ad. Monroe County, New York, October, 1882; G. Ward.

GROUP F.

1. WOOD DUCK; SUMMER DUCK (613. *Aix sponsa*). No. 88183. ♂ ad. Cayuga Lake, New York; Dr. R. W. Shufeldt, U. S. A.
2. BLACK MALLARD; DUSKY DUCK (602. *Anas obscura*). No. 76765. Eastern United States; Dr. A. L. Heermann (?).
3. BALDPATE; AMERICAN WIGEON (607. *Mareca americana*). No. 76766. ♂ ad. Dr. A. L. Heerman (?).
4. HOODED SHELDRAKE (638. *Lophodytes cucullatus*). No. 84751. ♂ ad. Chicago, Illinois, December, 1875; E. W. Nelson.

GROUP G.

1. HARLEQUIN DUCK (622. *Histrionicus minutus*). No. 89902. ♂ ad. Maine, winter; M. Hardy.
2. STELLER'S DUCK (625. *Cosmonetta stelleri*). No. 89903. ♂ ad. Kodiak, Alaska; W. J. Fischer.
3. SPECTACLED EIDER (626. *Lampronetta fischeri*). No. 88949. ♂ ad. Point Barrow, Alaska, June 11, 1882; J. Murdoch.
4. KING EIDER (629. *Somateria spectabilis*). No. 88959. ♂ ad. Point Barrow, Alaska, May 16, 1882; J. Murdoch.

GROUP H.

1. AMERICAN ANHINGA; SNAKE BIRD (649. *Plotus anhinga*). No. 77300. ♂ ad. Hernando County, Florida, March 26, 1876; G. Smith.
2. Ditto. No. 77302. ♀ ad. Hernando County, Florida, February 9, 1877; G. Smith.

GROUP I.

1. LAUGHING GULL (673. *Larus atricilla*). No. 77313. ♂ ad., winter plumage. Hillsborough County, Florida, February 11, 1876; G. Smith.
2. Ditto. No. 64393. Juv., first plumage. Atlantic coast, United States; Prof. S. F. Baird.
3. BONAPARTE'S GULL (675. *Larus philadelphiæ*). No. 84772. ♀ ad. Potomac River, District of Columbia, April 14, 1879; R. Ridgway.
4. SABINE'S GULL; FORK-TAILED GULL (677. *Xema sabinei*). No. 88889. ♂ ad. Point Barrow, Alaska, June 8, 1882; J. Murdoch.

5. FORSTER'S TERN (685. *Sterna forsteri*). No. 76774. ♂ ad. New Jersey?; Dr. A. L. Heermann.
6. LEAST TERN (690. *Sterna antillarum*). No. 80192. ♂ ad. Bone Island, Virginia, July, 1880; R. Ridgway.

GROUP J.

1. FULMAR PETREL (705 *Fulmarus glacialis*). No. 76293. ♀ ad., light phase. Ovipak, Greenland, August 10, 1878; L. Kumlien.
2. CINEREOUS SHEARWATER (708. *Puffinus kuhli*). No. 75294. ♀ ad. Beyrout, Syria; J. S. Van Dyck.
3. SOOTY SHEARWATER (714. *Puffinus fuliginosus*). No. 76515. Ad. Newfoundland Banks (Le Havre Bank); Capt. J. W. Collins.
4. LEACH'S PETREL (723. *Cymochorea leucorrhoa*). No. 79927. Ad. Newfoundland Banks; Capt. J. W. Collins.
5. FORK-TAILED PETREL (726. *Oceanodroma furcata*). No. 81216. Ad. Saint Michael's, Alaska; E. W. Nelson.

GROUP K.

1. WESTERN GREBE (729. *Æchmophorus occidentalis*). No. 77569. ♀ Pullus. Eagle Lake, California, July 2, 1877; H. W. Henshaw.
2. HORNED GREBE (732. *Dytes auritus*). No. 82316. ♂ ad. Potomac River, District of Columbia, April 25, 1881; H. Horan.
3. AMERICAN EARED GREBE (733 *a*. *Dytes nigricollis californicus*). No. 76343. Ad. Breeding plumage, Manhattan, Kansas, May 24, 1871; C. P. Blauchly.
4. AMERICAN EARED GREBE. No. 89795. Ad. (?), winter plumage. (Locality and collector unknown.)
5. THICK-BILLED, or PIED-BILLED, GREBE (735. *Podilymbus podiceps*). No. 84791. ♀ ad. Mount Carmel, Illinois, July 23, 1875; E. W. Nelson.

GROUP L.

1. RAZOR-BILLED AUK (742. *Alca torda*). No. 79020. ♀ ad. Godhavn, Greenland; Governor Fencker.
2. TUFTED PUFFIN (745. *Lunda cirrhata*). No. 62509. ♀ ad. Prybilov Islands, Alaska, June 28, 1872; H. W. Elliott.
3. HORNED-BILLED PUFFIN (746. *Ceratorhyncha occidentalis*). No. 76776. Ad. Farallone Islands, California; Dr. A. L. Heermann.
4. LEAST AUK (750. *Ciceronia pusilla*). No. 62628. ♂ ad. Saint Paul's Island, Alaska, May 23, 1872; H. W. Elliott.
5. CRESTED AUK (748. *Simorhynchus cristatellus*). No. 62571. ♂ ad. Saint Paul's Island, Alaska, June 18, 1872; H. W. Elliott.
6. WHISKERED AUK (749. *Simorhynchus? pygmæus*). No. 89141. ♂ ad. Copper Island, Kamtschatka, July, 1882; L. Stejneger.

7. BLACK-THROATED GUILLEMOT (753. *Synthliborhamphus antiquus*).
No. 89142. ♂ ad. Copper Island, Kamtschatka, July, 1882; L. Stejneger.

In addition to the above, there are exhibited separately the following mounted specimens:

BALD EAGLE; AMERICAN SEA EAGLE, (*Haliaëtus leucocephalus* L.).
No. 84529. ♀ ad. Mount Carmel, Illinois, January 1, 1871; R. Ridgway.

AMERICAN WHITE PELICAN (640. *Pelecanus erythrorhynchus* Gm.). No. 71051. ♀ ad. Grant County, Minnesota, April 27, 1876; G. B. Sennett.

BROWN PELICAN (641. *Pelecanus fuscus* L.). No. 86384. ♂ ad. Breeding plumage; La Paz, Lower California, February 24, 1882; L. Belding.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

D.

CATALOGUE

OF THE

ECONOMIC MOLLUSCA

AND THE

APPARATUS AND APPLIANCES USED IN THEIR CAPTURE AND PREPARATION FOR MARKET,

EXHIBITED BY THE

UNITED STATES NATIONAL MUSEUM.

BY

Lieut. FRANCIS WINSLOW, U. S. Navy.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.

INTRODUCTION.

It is proposed to give, in the following pages, a brief account of the economic mollusca of the United States, together with a description of the manner of conducting the various fisheries and their dependent industries. Minute detail of matter, whether of biological or economic interest, is not attempted; the design is to supplement the molluscan exhibit by an explanatory pamphlet, which will be illustrated by the objects exhibited. The information given is obtained chiefly from Professor Verrill's papers on the Invertebrates of Vineyard Sound, published in the Report of the United States Commissioner of Fish and Fisheries, and from the advance sheets of the Reports of Mr. Ernest Ingersoll on the Shell-Fish Industries of the United States, published by the Census Bureau. Many other authorities, too numerous to mention, have also been consulted.

The total annual product of the shell-fish industries of the United States amounts to 24,859,044 bushels, valued at $14,629,187. This total is divided among the various fisheries according to the following table:

Name.	Number bushels.	Value.
Oyster fishery	22,195,370	$13,438,852
Clam fishery	1,955,580	996,305
Mussel fishery	600,000	37,500
Scallop fishery	108,094	28,825
Abalone fishery	.....	127,705

While the oyster industry, on account of its importance, deserves the most and first attention, yet, as the collection on exhibition is part of that of the National Museum, it is deemed best to maintain the original systematic arrangement, and therefore the most highly organized of the the mollusca, the Cephalopods are first considered.

MOLLUSCA CEPHALOPODA.

The most recent authorities assign thirty species of cephalopods to the fauna of the eastern coast of North America. While so numerously represented, however, only a few of the species are found in sufficient abundance to make them of commercial value. These comprise *Ommastrephes illecebrosa*, *Loligo pealii*, *Loligo brevis*, and the gigantic squids (*Architeuthis*) of Newfoundland and adjacent coasts; of these, the most abundant and widely distributed is

Loligo pealii, Lesueur.

This is the common squid of the Atlantic coast of the United States; it is found from South Carolina to Cape Ann, Massachusetts, but is most abundant in Long Island and Vineyard Sounds. In depth it ranges from low-water mark to 50 fathoms; it is one of the Decapods or ten-armed class, of the *Dibranchiata*, or free-swimming cephalopods with but two branchiæ. As indicated by its classification, it has ten arms, two of which are tentacular, club-shaped at the extremities, and longer than the other eight. In the male the left ventral arm is modified to subserve the peculiar reproductive process characteristic of the cephalopods, and under the head of the female is a horseshoe-shaped tubercle for the same purpose. In this, as in other species, the integument of the body is provided with numerous little sacs, containing pigment granules of different colors, and called cromatophores; by contracting and expanding these, the animal can change its color with great rapidity. Professor Verrill describes a male specimen of *Loligo pealii* as having the upper surface of body, head, and caudal fin covered with rather large, circular cromatophores, but towards the margin of the fin and on the head the spots are smaller and less numerous, and the bluish-white body color more perceptible. Over most of the dorsal surface the cromatophores are arranged in circular groups, the center being a large, round spot of dark purple; this is surrounded by a circle of ground color, a circle of cromatophores of lake-red and pink, and a deeper lying circle of pale canary-yellow ones. When expanded the cromatophores are light to dark red, varying to purplish-red and pink; when contracted they become small points of brownish-purple. On the lower side the cromatophores are thinly scattered, and the dominant color is the blue-white of the body. The general appearance of the animal is reddish-brown. The arms are marked similarly to the lower part of the body; the eye is covered with a transparent membrane, and the pupils are brown or deep bluish-black. The body is somewhat elongated in form, and the caudal fin is long-rhomboidal, the outer angles obtusely rounded, and, in large specimens, its length is about two-thirds that of the body; when full grown the animal is from 6 inches to 1 foot long. The sexes are separated and reproduction is accomplished by means of the hecto-cotylized arm and horseshoe-shaped sucker. The spawning season lasts throughout the summer, but most of the eggs are laid in June and July. They are contained in long, gelatinous capsules, which are attached in clusters, often 6 and 8 inches in diameter, to seaweed, stones, and shells, or other common support. Each capsule is from 2 to 3 inches long, and contains from 20 to 200 eggs. Like the other species, this is nocturnal and gregarious in its habits. The schools are usually composed of individuals of the same size and age; when this is not the case the larger and older squids have been observed actively engaged in destroying and devouring their smaller companions. They also prey upon many

of the smaller fishes and crustaceans, and in turn are sought and eaten by the blue-fish, tautog, sea bass, striped bass, king-fish, and many other large market fishes, of whose food-supply this squid forms an important item. It is also secured, when possible, by the fishermen along the coast and used for bait; but in this particular it is not so important as *Ommastrephes illecebrosa;* its range, not much north of Cape Cod, being more remote from the scene of the cod-fisheries. There are two varieties of the *Loligo pealii;* viz., *borealis* and *pallida.* In the former the only difference of much importance is the relatively smaller suckers. In the latter (var. *pallida*), the distinguishing characteristics are a shorter and stouter body, broader and larger caudal fin, and larger size of suckers. It feeds, probably, upon the menhaden principally, and is, when adult, like *Loligo pealii*, food for large fishes, and when young is likewise devoured by numerous animals. The typical variety, *Loligo pealii*, is the only one exhibited.

Ommastrephes illecebrosa, Verrill.

This is the most common squid north of Cape Cod. It is abundant in Massachusetts Bay, the Bay of Fundy, and northward to Newfoundland. It is also found along the coast as far to the southward and westward as Newport, and in deep water as far south as Cape Hatteras. Its range in depth is probably as great if not greater than that of *Loligo pealii* it having been taken in 372 fathoms. It is known as the "short-finned squid," the "sea arrow" and the "flying calamary" and, like the *Loligo pealii*, is one of the Decapods of the class *Dibranchiata.* The extreme length of the adults, from tail to tip of tentacular arms, is from 12 to 17 inches, and the length of the body from 7 to 10 inches. The body measures from 4 to 6½ inches in circumference. The caudal fin is transversely rhomboidal, or broad spear-shaped and is one-third wider than long. The anterior margins are convexly rounded, and the fin is generally shorter and broader than in *Loligo.* The general appearance is long and slender. In the male, either the right or left ventral arm is modified, or hectocotylized, for purposes of reproduction. The ground color is of bluish-white, with green, blue and yellow irridescence on the sides and lower surface. The whole body, head, outer surface of arms and fins are more or less covered with small, unequal, circular, orange-brown and dark-brown spots, which are continually contracting and expanding, the contraction darkening and the expansion lightening the colors. On the lower surfaces the spots, or cromatophores, are less crowded than on the upper surfaces, where they are frequently in different and partially overlaying planes. The suckers on the arms are pure white. The eyes are dark, blue-black, and are provided with lids. The changing tints are described by Professor Verrill as passing over the body like a series of blushes. They usually appear in the water of a reddish-brown color or a pale, translucent bluish-white.

The reproductive process of this species has not yet been studied, nor

as yet have we any definite information regarding the time, place, or manner of spawning. It is probable that they spawn in the open sea and that the eggs will be found floating at the surface. Neither has any information as to the length of time required to reach maturity been obtained, but it probably lives several years. This squid is an exceedingly active creature, moving in any direction, with great velocity, by means of the reaction of the ejected jet of water from the siphon or funnel. When darting rapidly, the lobes of the caudal fin are wrapped about the body and the arms are held closely, in an acute bundle, in front, the animal thus being sharp at both ends and passing through the water with the least resistance. They are predatory, gregarious, and nocturnal in habits, swimming mainly at night, in schools, and attacking and devouring small fishes and crustraceans, especially shrimp, herring, and young mackerel. They change their color and appear translucent and pale when in pursuit of prey; and when that pursuit is so active that the young fish disappear, the squid will sink to the bottom, assume the color of the sand, and thus ambuscaded will await the return of its victim. They frequently, in their search for food, ground on the flats, and, as they pump out water from the funnel with great force under such circumstances, thus throwing themselves higher on the beach or shoal, they perish in great numbers. At such times they also discharge their ink in great quantities. This squid, like *Loligo pealii*, is eagerly pursued by the cod and other voracious fishes, and while young an especial enemy is the full-grown mackerel. Also like the *Loligo*, it devours its own young.

The *Ommastrephes* is a very important item in the bait supply of the codfishery, fully half the bank fishermen using squids or cuttles as bait. Mr. Ingersoll states over 500 sail are engaged in capturing them for that purpose. They are taken, generally accidentally, in the pounds and wiers, and more frequently by seeking them on flats and beaches where they have been left stranded by gales or receding tides. They are also captured by using "jigs" or groups of hooks which are moved up and down in the water and to which the squids cling. Their nocturnal habits and tendency to gaze at a bright light are also taken advantage of, and the fishermen go out on dark nights with torches in their boats, and, as the squids swim backward, they are gradually driven ashore. On account of its availability for bait for the cod-fisheries, its abundance and the proximity of its range to the fishing banks, this is the most valuable of the Cephalopods of the American coast.

Loligo brevis, Blainville.

This is the common squid or calamary of the southern coast of the United States. It ranges northward to Delaware Bay, is common from South Carolina to Florida and is found also along the Gulf coast. It is a smaller, shorter-bodied species than *Loligo pealii*, has short rounded caudal fins, very short upper arms, and large chromatophoric spots.

The body is short, thick, well rounded, and rather blunt posteriorly. The fins are broad and short, with posterior end very obtuse. The arms are all short, the two upper pairs being much shorter than the two lower. The tentacular arms have the "club" well developed. In the female there is no tubercle on the buccal membrane for attachment of spermatophores. The male has not been described, and consequently nothing is known of the methods, periods, or times of spawning. The adults are about 6 inches in total length, and sometimes larger. The chromatophores are large, of a dark purple color, and are regularly scattered on a pale ground-color. Above the eyes they are so closely crowded as to form dark blotches. The under side of the caudal fin is white. Though extensively distributed, this species is not very abundant, nor of much importance economically. It is used as bait, and is also sold as food in New Orleans markets.

Architeuthis.

GIANT SQUIDS.

These Squids frequent the waters of Newfoundland and the Newfoundland Banks, but apparently do not exist in great numbers, as Professor Verrill in his paper on the "Cephalopods of the Northeastern coast of America" mentions but twenty-six specimens of which he could obtain any definite knowledge. It is not unusual for them to be cast up on the Newfoundland beaches after gales, and occasionally they are found dead or dying on the surface of the water in the neighborhood of the Banks. Verrill expresses the opinion that they inhabit the colder fiörds of Newfoundland, and are rarely seen at the surface unless disabled or incapacitated by disease from pursuing their customary life. So few specimens have been obtained for study and so seldom have these gigantic Squids been observed, that very little is known of their anatomy, or biography and still less of their sexual characteristics. All that is certain is that in many points they resemble the smaller species; that they swim by means of the jet of water from the funnel; that they have the ability to discharge large quantities of "sepia" or "ink," and that they are probably carnivorous. Whenever found they are used for bait, for dog-food and as manure.

The model exhibited is of a specimen of *Architeuthis princeps*, Verrill, cast ashore on the coast of Newfoundland in 1877. It is not the largest specimen that has been seen, but was the one most perfectly preserved when it reached the hands of scientific observers.

Octopus punctatus, Gabb.

OCTOPUS, or DEVIL FISH.

This species exists on the northwest coast of the United States, and attains a large size, being probably the largest species of *Octopus* in

existence. Very little is known of it, though as a bait it is of considerable importance in the cod-fishery at the Shumagin Islands. The flesh is also eaten by the Indians.

In addition to this species there are several species of squids on the west coast that are occasionally eaten by the Chinese, especially one allied to *Ommastrephes*. The flesh is dried and exported to China, but the industry is not of sufficient importance to justify particular mention.

Mollusca encephala.

GASTEROPODA.

Like the *Cephalopoda*, the *Gasteropoda* of the American coast, while very numerously represented, are not of much importance economically. The abundance of more palatable, bivalve shell-fish, such as the oysters and clams, has prevented the univalves, even when edible, from receiving much attention. Doubtless many species, especially those of large size, like the *Fulgur carica* and *Buccinum undatum*, have been eaten in the past by the Indians and, indeed, the shell-heaps along the coast contain evidence of such having been the case; but in recent times the appropriation of this class of mollusks to the uses of man, with the exception of the genus *Haliotis*, has been so slight that it is impossible to obtain any statistics bearing upon the subject. A number of the Gasteropods have been catalogued as used for food or bait; but, with the exception above noted, they form a possible rather than a real food supply. Even their consumption as bait is inconsiderable, and nowhere is their pursuit reduced to any systematic or organized method. As, however, many of the Gasteropods are carnivorous and predatory, doing, at times, much damage to oyster beds and destroying numbers of other valuable mollusks, they become of consequence in any consideration of shell-fisheries and in their destructive relation they will be noticed in detail.

Buccinum undatum, Linné.

This animal is known, generally, as one of the "sea-snails," and sometimes as the "whelk." It has not a very wide distribution on the American coast, being uncommon south of Cape Cod, except in deep water. It is common in Massachusetts Bay and abundant further north, to the coast of Greenland. As a fossil it is common in the Post-Pliocene deposits of Maine, Canada, and Labrador. Though the ordinary American specimens, from shallow water, differ considerably from the European types, yet, as it is not difficult to form connecting series, and as the deep-water specimens differ very little from the European form, Professor Verrill decides that the two species are identical. This Gasteropod is available for food; but, though probably eaten by the Indians, is not at present sought, except occasionally as bait. It usually inhabits rocky bottoms, but is occasionally found elsewhere.

Littorina littorea (Linné), Menké.

PENNYWINKLE.

This species is not an indigenous one, having been introduced from Europe, probably with ballast, during the last fifteen or twenty years. It first appeared on the coast of Maine in 1868, and since then has spread gradually to more southern waters. In 1872 it was seen in the vicinity of Provincetown, Mass. In 1875 it was seen at Wood's Holl, but was abundant at Provincetown; and in 1880 had become abundant at Wood's Holl. It is now found as far west as Stonington, Conn. Though not used as food it is available for that purpose.

Ilyanassa obsoleta, Stimpson.

This small univalve has no distinctive common name, and goes by the general term of "sea-snail." It is found on the entire eastern and southern coasts of the United States, though not abundant south of Cape Cod, and is local in the Gulf of Saint Lawrence. It is found fossil in the Post-Pliocene of Massachusetts, Nantucket Island, Virginia, and South Carolina. The *Ilyanassa obsoleta* is, probably, the most abundant Gasteropod of the American coast. While it is naturally an inhabitant of muddy bottoms and flats, yet it lives and flourishes on sandy shores, among eel-grass, and on the piles and timbers of wharves equally well. It is found alike, far up estuaries and on the open coast and its crooked trail and burrows can be observed on every beach and shore. As the tide leaves the mud flats the animals are seen in immense numbers, especially in and about the pools. They perform the useful duty of scavengers, and are also sought and used for bait; but are not considered edible.

HALIOTIDÆ.

Genus **Haliotis**.—EAR-SHELLS, SEA-EARS, OR ABALONES.

There are four species of *Haliotis* that are of commercial importance: The "White Sea-Ear," or *Haliotis cracherodii;* the "Splendid Sea-Ear," or *Haliotis splendens;* the "Rough Sea-Ear," or *Haliotis corrugata;* and the "Red Sea-Ear," or *Haliotis rufescens*. One other species, *Haliotis kamchatkana*, is found on the coast of Alaska, but is rare. These Gasteropods are distributed along the whole North Pacific coast from San Francisco to the southward, including the peninsula of Lower California, though they decrease in abundance in the region of Cape Saint Lucas. They are also found in the Gulf of California, and along the Mexican coast. The "White Sea-Ear" (*Haliotis cracherodii*) is the most abundant, and is the one generally known in commerce. The "Splendid" and "Rough" species (*Haliotis splendens* and *Haliotis corrugata*) are most abundant in the neighborhood of San Diego. The shell of *Haliotis*

rufescens was the one principally used by the Indians in making their shell money, but is now rare and is usually found to the northward of San Diego. All the species are known on the coast as "Abalones," a name originated by the Spanish-Americans.

The Abalones dwell upon weed-grown rocks, and feed upon marine *algæ*. They have a broad, flat, muscular foot, adapted rather for holding than for locomotion, by which they cling to the rocks with great tenacity. Through the small, circular holes, near the margin of the shell, the animal, when clinging to its support, receives its supply of oxygen and, by means of the small tentacles which protrude through them, is warned of the approach of danger. No species of the genus *Haliotis* are found on the eastern coast of the United States, but on the western coast the trade in both shells and flesh is of considerable value.

The fishery is carried on mainly by the Chinese inhabitants, who preserve and eat the flesh, which is said to be nutritious but indigestible. The method of preserving is the simple one of drying and salting, after which the major portion of the crop is exported to China. It is estimated that about six tons of living animals must be gathered to obtain one ton of flesh, and as there were some 388 tons of meats gathered in 1879–'80, that amount indicates that nearly 2,400 tons of living Abalones were taken during the season. The fishery has of late years become so severe that the coast of California has been swept and the fishermen are compelled to resort to the islands lying off the peninsula. The usual method is for Americans to supply the necessary capital and transportation to the islands and the Chinese fishermen to do the work, the former taking the shells and the latter the flesh obtained from the season's fishery. The tenacity with which the animal clings to the rocks by means of its muscular foot is so great that it is not always easy to remove it. Several methods are used; a trowel or spade is employed, usually, to slip under the animal and so dislodge it; and another method, not so generally used, is to pour hot water over them and then push them suddenly adrift with the foot.

The fishery is, however, not very laborious and in no way hazardous. The animals live but a little below low-water mark, and the islands and coasts on which they are at present found are remarkable for equability of climate. The growing scarcity of the animals alone prevents the fishery from assuming greater importance. The shells are exported in large numbers to Europe, and are there used in various ways. A smaller number are retained and used in ornamental manufactures in this country.

The value of the fishery for the year 1879 was:

	Value.
Meats, 777,600 pounds	$38,800
Shells, 3,833,500 pounds	88,825
Total	127,625

Fulgur carica, Conrad.

This species is found along the eastern coast of the United States from Florida to Cape Cod. It is abundant in Vineyard and Long Island Sounds, in from 1 to 10 fathoms. It occurs in the Miocene formation of Maryland, and in the Post-Pliocene of Virginia, North and South Carolina, and Florida.

Sycotypus canaliculatus, Gill.

This is found on the eastern coast of the United States from Florida to Cape Cod, also on the west coast of Florida and the northern shores of the Gulf of Mexico. It is abundant in Vineyard and Long Island Sounds, in from 1 to 8 fathoms of water. It occurs in the Post-Pliocene of Virginia, North and South Carolina and Northern Florida, and in the Miocene of Maryland and Virginia.

As these species generally exist in company, and in habits have a close relationship, they are considered together, though the former is found in greater abundance in more southern waters than the latter, and has structural and other distinguishing peculiarities. Both species are occasionally found on sandy flats and in tide pools, especially during the spawning season, but they generally live in deeper water and off shore. They are found, also, on rocky shores but usually are met with on gravelly and shelly bottoms, where they find a larger amount of sustenance. These large shells are readily recognized by the fishermen and inhabitants of the coast, who have assigned them various designations. On the borders of Long Island Sound and Long Island they are called indiscriminately "Periwinkles"; while on the coast of New Jersey this is abbreviated to "Winkle," or corrupted into "Wrinkle." The *Sycotypus canaliculatus* is also called the "Hairy Whelk," a designation due to its hairy epidermis. This species varies in color very much, and may be found of a light orange or livid brown. The *Fulgur carica* also varies with advancing age or with the climate.

The eggs of both species are deposited in capsules, which are strung together in strings frequently a foot or more in length. Each capsule contains some twenty or more eggs, and from fifty to one hundred capsules are found in a string. There are marked differences in the character of the capsules of each species by which they may be distinguished; that of *F. carica* being smaller, thicker, and having truncate edges; while *S. canaliculatus* has larger, thinner capsules, with a thin, sharp, outer edge and radiating ribs on the sides; but both are peculiar and will be readily recognized after inspection of the specimens exhibited. As both the *Fulgur* and *Sycotypus* are predatory and carnivorous, destroying by means of the teeth on the lingual ribbon any unfortunate bivalve they may meet; as they are especially enemies of the oyster and clam; and as they are in the present day of little or no use to man, both they and their curious egg-cases had best be destroyed whenever met.

Urosalpinx cinerea, Stimpson.

This is the "Drill" or "Rough Whelk," and is abundant along the whole eastern coasts of the United States from Massachusetts Bay to Florida. It is also found on the west coast of Florida and in the Gulf of Mexico. It is more rare and local north of Massachusetts Bay, but extends to the Gulf of Saint Lawrence. It occurs in the Post-Pliocene deposits of Massachusetts, Nantucket, Virginia, North and South Carolina, in the Pliocene of South Carolina, and Miocene of Maryland.

Purpura lapillus, Lamarck.

The shell of this animal resembles somewhat that of the preceding species, and the animal itself has similar carnivorous habits, but is a more arctic type, living in the colder waters north of Cape Cod and inhabiting exposed rocky headlands, while the *U. cinerea* is found at all points. The *Purpura lapillus* is extremely abundant on the coasts of Maine and Nova Scotia, and extends to Long Island Sound. It has been found in the Post Pliocene of Maine, but is not a common fossil.

The *Urosalpinx cinerea* is more abundant in brackish water and on shelly bottoms than elsewhere, but is found indiscriminately wherever there is suitable food. The *Purpura lapillus*, though like the "Drill," a borer, confines itself to the barnacles growing on the rocks; but the *Urosalpinx* is much more harmful and is an inveterate enemy of the oyster, boring, by means of the sharp, flinty teeth that cover its tongue, round holes through the oyster-shell and sucking out the contents. It is particularly destructive to young oysters in Chesapeake Bay, and a shell has been observed having fifty-four young attached to it, of which fifty had been destroyed by the "Drill." On some of the beds fully 50 per cent. of the young perish from this cause. It is probable that the *Purpura lapillus* only lacks opportunity to effect similar results, and both the animals and their curious vase-shaped egg-capsules, attached to stones and rocks by a short stalk, should be destroyed whenever met.

Lunatia heros, Adams.

Is found from Georgia to the Gulf of Saint Lawrence. It is abundant on the coast of New Jersey and southern coast of Long Island from low water to 10 fathoms. Occurs in the Miocene formation of Maryland, Virginia, and South Carolina, in the Pliocene of South Carolina, and in the Post Pliocene of Canada and South Carolina.

Neverita duplicata, Stimpson.

Exists on the eastern coast of the United States from Florida to Massachusetts Bay, and on the northern and western shores of the Gulf of Mexico. It is abundant from Long Island Sound southward, and is found as a fossil in the Miocene and Post Pliocene deposits of Virginia, North and South Carolina, in the Miocene of Maryland, and in the Plio-

cene of South Carolina. Like the *F. carica* and *S. canaliculatus*, *Lunatia heros* and *Neverita duplicata* are generally found in company; having the same habits and appearance, to the casual observer, they are frequently confounded one with the other, and are usually known to the fishermen and long-shoremen as "Sea-Snails," and sometimes as "Winkles" or "Periwinkles." On account of their similarity in distribution and close relationship in habits, they are considered together.

The *Lunatia heros* is found on nearly all sandy shores, in pure water, and apparently prefers the open coast and heavy surf, growing under those conditions to a larger size than elsewhere. It is by no means as large as the *Fulgur* or *Sycotypus*, but has been known to reach five inches in length by nearly four in breadth. When in motion the foot and soft parts of the body are protruded to a remarkable extent, and spread out so broadly as to almost conceal the shell. The foot is large, concave below when expanded, and when extended beneath the sand affords the animal a secure anchor or hold; it is the organ by which the animal burrows for protection or prey. Both the *Lunatia heros* and the *Neverita duplicata* are destructive, boring round holes through bivalve shells by means of small teeth on the lingual ribbon, and then sucking out the contents of the shells. Nor do they confine their operations to the bivalves, but attack univalves, not excepting their own young, as well. *Neverita duplicata* differs from its usual associate in being found less frequently on the outer beaches and growing more abundantly, though not to so large a size, elsewhere. It is a more southern species than the *Lunatia heros*, and is not common north of Cape Cod. The egg cases of both species are often met on mud and sand flats at low water, and are very curious. They consist of a broad, thin ribbon of sand, coiled in a circle. The ribbon is composed of innumerable little cells, each containing eggs, and surrounded by fine sand cemented together by mucus. The cells can easily be seen by holding the ribbon to the light, and for the same reason given for destroying the egg-capsules of the *Fulgur* and *Sycotypus*, these egg-cases should meet a similar fate when encountered.

While both *L. heros* and *N. duplicata* are found on sandy and gravelly shores, their natural ground, where they exist in greatest abundance, is the shelly bottoms of oyster beds and similar areas.

Crepidula plana, Say.

Crepidula fornicata, Lamarck.

These two species are neither directly useful nor harmful, but when present in large numbers they form one of the indications of the health of an oyster-bed and are therefore exhibited. The former is known as the "Slipper-Shell" and the latter as the "Boat-Shell." Both are found from Massachusetts to Florida, and on the northern shores of the Gulf of Mexico.

Ostrea virginica, Gmelin.

This, the most important mollusk of American waters, is known also as *Ostrea virginiana*, Lister, *Ostrea borealis*, Lamarck, and *Ostrea canadensis*, Bruguière. It is the common American oyster, and the many various forms of shell met along the coast are due to local and peculiar conditions, and are by no means constant either in the locality or shell itself; nor is there any structural difference in shell or body in any of the varieties which have received specific names. This is shown by the series illustrating the variations of *Ostrea borealis* and *Ostrea virginica*. The specimens in this series are from all parts of the coast, and in some of them the change from one form to the other and back is very marked. The series of specimens illustrating the peculiarities of the different species, *Ostrea virginica*, *O. borealis*, *O. lurida*, and *O. edulis*, will afford the observer a means of comparing the dissimilarities which exist between well-defined species, such as the *virginica*, *lurida*, and *edulis*, with those existing between *O. virginica* and *O. borealis*, which are only nominal varieties.

Oysters are found along the entire east and west coasts of the United States with the exception of the lower part of the peninsula of Florida and the coast of Maine. Their absence from the southern waters of Florida is due probably to the absence of fresh-water streams; and their disappearance from the coast of Maine, where the shell-heaps testify to their existence in large numbers in the past, is the result of climatic changes, coupled, most likely, with the inordinate fishery of the aborigines. The shells are found, fossil, in the Post-Pliocene deposits of Massachusetts, Nantucket, and Gardiner's Island, in the Pliocene of South Carolina, and in the Miocene of Virginia and South Carolina. The distribution of this species will be best understood and appreciated by viewing the charts, showing the areas and positions of the beds. The most noticeable feature about them is the contrast between the cultivated areas of the Northern and Southern States.

BIOLOGY.

It was long supposed that the American oyster resembled the European species (*Ostrea edulis* and other varieties) in its method of reproduction and sexual characters; and on that account no attempts were made to adapt to the oyster the methods of artificial impregnation. In 1879, however, Dr. W. K. Brooks made the initial experiments and proved the possibility of impregnating the eggs and maintaining the embryos alive for some time, without the aid of the parents. The experiments were so interesting and important, that Dr. Brooks' description of the manner of conducting them is here reproduced:

"BREEDING HABITS OF THE AMERICAN OYSTER.

"Our knowledge of the development of the oyster is derived from the fragmentary observations of various German, French, English, and Rus-

sian embryologists, whose work will be noticed at length farther on. While the subject has received the attention of a number of observers, no one has been able to get anything like a complete series of the early stages of development, and I approached my work without hope of accomplishing much of purely scientific value, although I did expect to obtain some information as to the time and conditions of spawning, and other questions of economic interest. My uncertainty of success was increased by the total failure of an attempt which I had made the summer before.

"All the published papers upon the subject state that the eggs are fertilized inside the body of the parent, and that the young are carried inside the parent shell until they are quite well advanced in development, and provided with shells of their own; that they swim about after they are discharged from the parent until they find a place to attach themselves, but that they undergo no change of structure between the time when they leave the parent and the time when they become fixed. Misled by these statements, which are not true with our species, I opened numbers of oysters during the summer of 1878, and carefully examined the contents of the gills and mantle chambers, but found no young oysters. I concluded that the time during which the young are carried by the parent must be so short that I had missed it, and I entered upon the work this season with the determination to examine adult oysters every day through the breeding season in search of young, and at the same time try to raise the young for myself by artificially fertilizing the eggs after I had removed them from the body of the parent.

"I met with complete success with the second method from the beginning, and succeeded in raising countless millions of young oysters, and in tracing them through all their stages of development until they had acquired all the characteristics which the European embryologists have described and figured in the young of the European oyster at the time it leaves its parent to become fixed for life.

"I reached Crisfield on the 19th of May, and established myself about three miles from the town and about half a mile from Pokamoke Sound, and on Monday, the 21st, I opened a dozen fresh oysters, and found three females with their ovaries filled with ripe ova, and one male with ripe spermatozoa.

"I mixed the contents of the reproductive organs of these four oysters, and within two hours after the commencement of my first experiment, I learned by the microscope that the attempt at artificial fertilization was successful, and that nearly all of my eggs had started on their long path towards the adult form.

"I made careful microscopic examination of the gills and mantles of all these oysters, but neither at this time nor afterwards did I find any fertilized eggs or young inside the parent shell, although I examined more than a thousand adults during the season. During the summer I found females with the ovaries so distended with ripe eggs that they

were oozing from the openings of the oviducts; others where the ovaries were half emptied, and others which had discharged almost all their eggs, and others at all the intermediate stages, but in no case did I find a single developing egg inside the shell of the parent.

"ARTIFICIAL IMPREGNATION OF THE OYSTER EGGS.

"If a number of oysters are opened during the breeding season, a few will be found with the reproductive organ greatly distended and of an uniform pure opaque white color. These are oysters which are spawning or nearly ready to spawn.

"If the point of a knife be pushed into the reproductive organ a milk-like fluid will ooze out of the cut, and a little of it may be taken up on a knife blade and transferred to a glass slide for examination. The drop of fluid should be thoroughly mixed with a drop of sea water and placed on the slide, and gently covered with a cover-glass, and examined with a magnifying power of about one hundred diameters. If the specimen is a female, this power will show that the white fluid is almost entirely made up of irregular pear-shaped ovarian eggs (Fig. 49), each of which contains a large circular transparent germinative vesicle surrounded by a layer of granular slightly opaque yolk. It is almost impossible to describe the slight differences which distinguish the perfectly ripe egg from those which are nearly ripe but not capable of fertilization, although a very little experience will enable one to tell whether it is worth while to attempt the fertilization of the eggs of any given female.

"When the drop of fluid is thoroughly mixed with the sea water, the eggs should appear clean, sharply defined, separate from each other, and pretty uniformly distributed through the drop, as shown in the figure. If they adhere to each other, or if their outlines are indistinct, or if their is much finer granular matter scattered between the eggs, it is probable that the attempt at artificial fertilization will at best be only partially successful.

"When a perfectly ripe female is found, it should be set aside and the search continued for a male. The question of the sex of the oyster has long been a matter of dispute, and the subject will be fully discussed in another place. All that concerns us now is to know that for all practical purposes the sexes are separate in the European as well as the American oyster. At the breeding season each individual is either exclusively a male or exclusively a female. Out of several thousand which I examined, I have not found one which contained both eggs and male cells, and all the best authorities upon the European oyster make the same statement, although there is some reason for the belief that an oyster may give rise to eggs one season and to male cells another year. When a drop of the milky fluid from a ripe male is mixed with a little sea water and examined with a magnifying power of one hundred diameters, it is seen at a glance to be quite different from the fluid of a female. There are no large bodies like the eggs, but the fluid is

filled with innumerable numbers of minute granules (Fig. 48), which are so small that they are barely visible when magnified one hundred diameters. They are not uniformly distributed, but are much more numerous at some points than at others, and for this reason the fluid has a cloudy or curdled appearance. By selecting a place where the granules are few and pretty well scattered, very careful watching will show that each of them has a lively dancing motion, and examination with a power of five hundred diameters will show that each of them is tadpole-shaped (Fig. 50), and consists of a small, oval, sharply defined 'head' and a long, delicate 'tail,' by the lashing of which the dancing is produced.

"It is more difficult to decide whether the male cells are perfectly ripe than it is to decide in the case of the eggs. With a magnifying power of five hundred diameters, each 'head' should have a clear, well-marked outline, and they should be very uniform in size, and separated from each other, as in Fig. 50. Under very favorable circumstances this power should also show the 'tails' as very faint undulating lines.

"If the 'heads' vary much in size, or if they are aggregated into bunches, with the 'tails' radiating from the bunches in all directions, or if there is much granular matter so small that the outlines of the particles are not visible when magnified five hundred diameters, the fluid is not perfectly ripe, and fertilization with it will not in all probability be very successful.

"NUMBER OF EGGS.

"As the male cells are infinitely more numerous than the eggs, the ripe fluid from even one small male is enough to fertilize all the eggs of five or six large females.

"The number of male cells which a single male will yield is great beyond all power of expression, but the number of eggs which an average female will furnish may be estimated with sufficient exactness. A single ripe egg measures about one five-hundredth of an inch in diameter, or five hundred laid in a row, touching each other, would make one inch; and a square inch would contain five hundred such rows, or $500 \times 500 = 250{,}000$ eggs. Nearly all the eggs of a perfectly ripe female may be washed out of the ovary into a beaker of sea water, and as they are heavier than the sea water, they soon sink to the bottom, and the eggs of a medium sized female will cover the bottom of a beaker two inches in diameter with a layer of eggs one-twentieth of an inch deep. The area of the bottom of a beaker two inches in diameter is a little more than three square inches, and a layer of eggs one-twentieth of an inch deep, covering three square inches, is equal to one three-twentieths of an inch deep and two square, and as a single layer of eggs is one five-hundredth of an inch thick, a layer three-twentieths of an inch thick will contain seventy-five layers of eggs, with 250,000 eggs in each layer, or 18,750,000 eggs. It is difficult to get the eggs, perfectly pure, and if

we allow one-half for foreign matter and errors of measurement, and for imperfect contact between the eggs, we shall have more than nine millions as the number of eggs laid by an oyster of average size, a number which is probably less than the true number.

"Möbius estimates the number of eggs laid by an average European oyster at 1,012,925, or only one-ninth the number laid by an ordinary American oyster, but the American oyster is very much larger than the European, while its eggs are less than one-third as large, so the want of agreement between these estimates does not indicate that either of them is incorrect.* Another estimate of the number of eggs laid by the European oyster is given by Eyton (History of the Oyster and Oyster Fisheries, by T. C. Eyton. London, 1858). He says, p. 24, that there are about 1,800,000, and therefore agrees pretty closely with Möbius.

"An unusually large American oyster will yield nearly a cubic inch of eggs, and if these were all in absolute contact with each other, and there were no portions of the ovaries or other organs mixed with them, the cubic inch would contain 500^3, or 125,000,000. Dividing this, as before, by two, to allow for foreign matter, interspaces, and errors of measurement, we have about 60,000,000 as the possible number of eggs from a single oyster.

"Although each male contains enough fluid to fertilize the eggs of several females, there does not seem to be much difference in the number of individuals of the two sexes. When a dozen oysters are opened and examined there may be five or six ripe females and no males, but in another case a dozen oysters may furnish several ripe males but no females, and in the long run the sexes seem to be about equally numerous. Oystermen believe that the male may be distinguished from the female by certain characteristics, such as the presence of black pigment in the mantle, but microscopic examination shows that these marks have no such meaning, and that there are no differences between the sexes except the microscopic ones. It is not necessary to use the microscope in every case, however, for a little experience will enable a sharp observer to recognize a ripe female without the microscope. If a little of the milky fluid from the ovary of a female with ripe or nearly ripe eggs, to be taken upon the point of a clean, bright knife-blade, and allowed to flow over it in a thin film, a sharp eye can barely detect the eggs as white dots, while the male fluid appears perfectly homogeneous under the same circumstances, as do the contents of the ovary of an immature female, or one which has finished spawning. When the eggs are mixed with a drop of water, they can be diffused through it without difficulty, while the male fluid is more adhesive and difficult to mix

*"Möbius' measurement, from 15 to 18 millimeters, is given (Austern und Austernwirtschaft, 1877), as the diameter, not of the egg, but of the embryo, but his figures show that the European oyster, like the American, does not grow much during the early stages of development, but remains of about the same size as the egg."

with the water. By these indications, I was able in nearly every case to judge of the sex of the oyster before I had made use of the microscope.

"In order to fertilize the eggs, all that is necessary is the mixture of the ripe eggs with a little of the ripe male fluid in a drop of water. If the point of a knife-blade be dipped in the fluid from a female and touched to a glass slide, and then dipped into the fluid of a male, and touched to the same part of the slide, and a drop of sea water be added, to cause the two to meet, most of the eggs will be fertilized, and their early stages of development can be studied in a single drop of water, but to secure the fertilization and healthy development of large numbers of eggs, several precautions are necessary, as well as a few instruments and pieces of apparatus.

"The following is a list of the things needed for procuring, fertilizing, and hatching the eggs: A pair of sharp-pointed scissors; a pair of small forceps; half a dozen watch crystals; a set of about half a dozen glass beakers, or tumblers, of different sizes, from half a pint up to half a gallon; two or three dipping tubes, or glass tubes six or eight inches long, open at both ends, but with one end drawn out to a fine point; a small glass or rubber siphon for drawing the water out of the beakers. For tracing the development of the eggs, a microscope, magnifying at least one hundred diameters, and half a dozen glass slides and thin glass covers are wanted.

"After the oysters have been opened, and at least one ripe male and one ripe female found, cut off the mantle lobes and gills of the male with the scissors, close to the visceral mass, and tear them out with the forceps and throw them away. Cut around the adductor muscle with the scissors, so that the visceral mass may be lifted out of the shell and transferred to a small saucer or to a watch crystal. Holding the visceral mass with the forceps, cut out with the scissors as much as possible of the digestive organs and liver and throw them away, and then chop up the reproductive organs with the scissors, picking out and throwing away any fragments of the liver, digestive organs, mantle or gills which may present themselves. In order to have the young oyster thrive, the water must be kept free from fragments of the various organs of the adult, as these would soon decay and destroy the embryos, and it is therefore important to remove them as completely as possible. After the mass has been chopped up as fine as possible, fill up the watch crystal with fresh sea water, stir it up, and then allow it to run into one of the smallest beakers, which has been nearly filled with sea water. As the water runs out of the watch crystal, be careful to allow as few of the fragments as possible to run with it."

"Now fill up the watch crystal with water again, and stir and pour off as before, and repeat the process until nearly all of the male fluid has been washed out of the fragments and poured into the beaker. Stir the contents of the beaker for a short time, and then allow it to stand

about five minutes, to allow any fragments to settle to the bottom, then pour the fluid, which should be quite milky, into another small beaker, leaving behind, to be thrown away, any particles which may have settled to the bottom. The male cells retain their full vitality for several hours after they have been mixed with sea water, so the beaker may be set aside to wait until the eggs are ready. The eggs swell up and break to pieces within a very few minutes after they are mixed with water, unless they are fertilized at once, so it is much better to add the eggs to a previously prepared mixture of male cells and water than it is to put the eggs into the water to wait until the male fluid is got ready.

"Taking now one of the females, remove and chop up the ovary in the same way in another watch crystal, observing the same precautions in removing all portions of the body. Fill the watch glass with water, and stir and pour off into the beaker as before, giving the contents of the beaker a good stirring after each lot of eggs is added, in order to diffuse them through the water at once, and thus insure the speedy contact of each of them with some of the male cells.

"Fill the crystal with water again, and stir and pour off, and repeat until all the eggs have been washed out of the fragments of the ovary."

"Another female may now be cut up, and the eggs may be added to the contents of the same beaker; but if the females are large, and yield many eggs, it is not best to use more than one, for although there are enough male cells to fertilize a very great number of eggs, the eggs are heavier than water and soon sink to the bottom, and if they form a very thick layer, only those which lie near the surface have room to develop.

"The beaker should now be allowed to stand for about ten minutes, and in the mean time some of the eggs may be picked out with a dipping-tube, for examination under the microscope. In using the dipping-tube, cover the large end with the tip of the finger, and run the small end down close to the bottom of the beaker, and then take the finger off the top, and as the water runs in at the bottom it will carry some of the eggs with it. When the tube is filled, place the finger on the top again, and draw it out of the water, and, holding it perpendicularly on the center of a glass slide, and taking the finger off the top, allow a good-sized drop to run out into the slide.

"If things are working properly, each egg should now have a number of male cells attached by their heads to its outer surface, with their tails radiating from it in all directions, as shown in Fig. 51.

"It is not necessary that more than one male cell should fasten on to each egg, but they usually cover them in such numbers that the lashing of their tails causes the eggs to rotate and move through the water.

"As soon as all the eggs have male cells attached to them, it is necessary to get rid of the superfluous male fluid, for it would soon decay and pollute the water if it were allowed to remain, and if it is not drawn off from the eggs while they are at the bottom, it is almost impossible

to remove it after the embryos have begun to swim, without loosing them as well.

"After a final stirring, the beaker should be allowed to stand for about five minutes, to allow the eggs to settle to the bottom, and the fluid above them should then be drawn off through a siphon, reaching nearly but not quite down to the eggs. A fresh supply of sea-water should then be added, and the eggs stirred and allowed to settle, and the water drawn off as before; and this should be repeated until the water, after the eggs have settled to the bottom, remains clear.

"The beaker may now be set aside where it will not be exposed to sudden changes of temperature, and the eggs will require no further attention until the embryos begin to swim, which will be in from two to six hours, according to the temperature. The little oysters must of course be supplied with fresh sea-water from time to time during their development, and as they are so small that the water cannot be drawn off after they begin to swim, they must be supplied with fresh water by transferring them from time to time to larger and larger beakers. In two hours or so after the eggs are fertilized the embryos begin to swim, and crowd to the surface of the water in great numbers, and form a thin stratum close to the surface. This layer of embryos may be carefully siphoned off into a very small beaker, and a little fresh sea-water added. In an hour or so there will be a new layer of embryos at the surface of beaker No. 1, and these should also be siphoned into No. 2, and this should be repeated as long as the embryos continue to rise to the surface of the first beaker. Every five or six hours a little fresh sea-water should be poured from a height of a foot or more into beaker No. 2, until it is filled. The contents should then be poured into a larger beaker, and sea-water added four or five times a day as before. In this way the embryos may be kept alive for a week, although they have by this time got into such a large vessel that it is almost impossible to find any of them for microscopic examination.

"THE DEVELOPMENT OF THE EGGS.

"I will now attempt a brief, popular account of the changes through which the fertilized egg is gradually converted into the complex body of the adult oyster.

"The body of the oyster, like that of all animals, except the very simplest, is made up of organs, such as the heart, digestive organs, gills, and reproductive organs; and these organs are, at some period in the life of the oyster, made up of microscopic cells. The eggs shown in Figs. 49 and 53 will answer to illustrate the character of the cells which compose the body; each of these consists of a layer of protoplasm around a central nucleus, which, in the egg, is a large, circular, transparent body known as the germinative vesicle. Each cell of the body is able to absorb food, to grow and to multiply by division, and thus to contribute to the growth of the organ of which it forms a part. The

ovarian eggs are simply the cells of an organ of the body, the ovary, and they differ from the ordinary cells only in being much larger and more distinct from each other; and they have the power, when detached from the body, of growing and dividing up into cells, which shall shape themselves into a new organism like that from whose body the egg came. Most of the steps in this wonderful process may be watched under the microscope, and, owing to the ease with which the eggs of the oyster may be obtained, this a very good egg to study.

"About fifteen minutes after the eggs are fertilized they will be found to be covered with male cells, as shown in Fig. 51. In about an hour the egg will be found to have changed its shape and appearance. It is now nearly spherical, as shown in Fig. 1, and the germinative vesicle is no longer visible. The male cells may or may not still be visible upon the outer surface. In a short time a little transparent point makes its appearance on the surface of the egg, and increases in size, and soon forms a little projecting transparent knob—the *polar globule*—which is shown in Fig. 3 and in succeeding figures.

"Recent investigations tend to show that while these changes are taking place one of the male cells penetrates the protoplasm of the egg and unites with the germinative vesicle, which does not disappear, but divides into two parts, one of which is pushed out of the egg and becomes the polar globule, while the other remains behind and becomes the *nucleus* of the developing egg, but changes its appearance so that it is no longer conspicuous. The egg now becomes pear-shaped, with the polar globule at the broad end of the pear, and this end soon divides into two parts, so that the egg (Fig. 6) is now made of one large mass and two slightly smaller ones, with the polar globule between them.

"The later history of the egg shows that at this early stage the egg is not perfectly homogeneous, but that the protoplasm which is to give rise to certain organs of the body has separated from that which is to give rise to others.

"If the egg at the stage shown in Fig. 6 were split in the plane of the paper, we should have what is to become one-half of the body in one one part and the other half in the other. The single spherule at the small end of the pear is to give rise to the cells of the digestive tract of the adult, and to those organs which are to be derived from it, while the spherules at the small end are to form the cells of the outer wall of the body and the organs which are derived from it, such as the gills, the lips, and the mantle, and they are also to give rise to the shell. The upper portion of the egg in this and succeeding figures is to become the ventral surface of the adult oyster, and the surface which is on the right side in Fig. 6 is to become the anterior end of the body of the adult. The figure, therefore, shows the half of the egg which is to become the left half of the body. The upper portion of the egg soon divides up into smaller and smaller spherules, until at the stage shown in Figs. 24, 25, and 26 we have a layer of small cells wrapped around

the greater part of the surface of a single large spherule, and the series of figures shows that the latter is the spherule which is below in Fig. 6. This spherule now divides up into a layer of cells, and at the same time the egg, or rather the embryo, becomes flattened from above downward, and assumes the shape of a flat oval disk. Figs. 29 and 30 are views of the upper and lower surface of the embryo at about this time. In a sectional view, Fig. 31, it is seen to be made up of two layers of cells; an upper layer of small transparent cells, *ec*, which are to form the outer wall of the body, and which have been formed by the division of the spherules which occupy the upper end of the egg in Fig. 25, and a lower layer of much larger, more opaque cells, *g*, which are to become the walls of the stomach, and which have been formed by the division of the large spherule *a* of Fig. 25.

"This layer is seen in the section to be pushed in a little towards the upper layer, so that the lower surface of the disk-shaped embryo is not flat, but very slightly concave. This concavity is destined to grow deeper until its edges almost meet, and it is the rudimentary digestive cavity. A very short time after this stage has been reached, and usually within from two to four hours after the eggs were fertilized, the embryo undergoes a great change of shape, and assumes the form which is shown in three different views in Figs. 32, 33, 34, and 35.

"A circular tuft of long hairs or cilia has now made its appearance at what is thus marked as the anterior end of the body, and as soon as these hairs are formed they begin to swing backwards and forwards in such a way as to constitute a swimming organ, which rows the little animal up from the bottom to the surface of the water, where it swims around very actively by the aid of its cilia. This stage of development, Fig. 32, which is of short duration, is of great importance in raising the young oysters, for it is the time when they can best be siphoned off into a separate vessel and freed from the danger of being killed by the decay of any eggs which may fail to develop. On one surface of the body at this stage, the dorsal surface, there is a well marked groove, and when a specimen is found in a proper position for examination, the opening into the digestive tract is found at the bottom of this groove. Fig. 33 is a sectional view of such an embryo. It is seen to consist of a central cavity, the digestive cavity, which opens externally on the dorsal surface of the body by a small orifice, the primitive mouth, and which is surrounded at all points, except at the mouth, by a wall which is distinct from the outer wall of the body. Around the primitive mouth these two layers are continuous with each other.

"The way in which this cavity, with its wall and external opening, has been formed will be understood by a comparison of Fig. 33 with Fig. 28. The layer which is below in Fig. 28 has been pushed upwards in such a way as to convert it into a long tube, and at the same time the outer layer has grown downwards and inwards around it, and has thus constricted the opening. The layer of cells which is below in

Fig. 28 thus becomes converted into the walls of the digestive tract, and the space which is outside and below the embryo in Fig. 28 becomes converted into an inclosed digestive cavity, which opens externally by the primitive mouth.

"This stage of development, in which the embryo consists of two layers, an inner layer surrounding a cavity which opens externally by a mouth-like opening, and an outer layer, which is continuous with the inner around the margins of the opening, is of very frequent occurrence, and it has been found, with modifications, in the most widely separated groups of animals, such as the star-fish, the oyster, and the frog, and some representatives of all the larger groups of animals, except the Protozoa, appear to pass during their development through a form which may be regarded as a more or less considerable modification of that presented by our oyster embryo. This stage of development is known as the *gastrula* stage.

"Certain full-grown animals, such as the fresh-water hydra and some sponges, are little more than modified gastrulas. The body is a simple vase with an opening at one end communicating with a digestive cavity, the wall of which is formed by a layer of cells which is continuous around the opening with a second layer which forms the outer wall of the body. This fact, together with the fact that animals of the most widely separated groups pass through a gastrula stage of development, has led certain naturalists to a generalization, which is known as the 'gastrula theory.' This theory or hypothesis is that all animals, except the Protozoa, are more or less direct descendants of one common but very remote ancestral form, whose body consisted of a simple two-walled vase, with a central digestive cavity opening externally at one end of the body.

"Hæckel, who is the originator and leading advocate of this hypothesis, has proposed to call this ancestral form a 'Gastræa;' and the gastrula stage of development he regards as a trace or indication of this distant ancestry, which is still retained and passed through during the early stages of the development of animals which are now very widely separated.

"The gastrula theory cannot be regarded as one of the established generalizations of science, and the evidence which has so far been accumulated by embryologists is not by any means straightforward or satisfactory. The theory is one of the most interesting embryological problems under discussion, however, and any new information which bears upon it is of value.

"The fact that the oyster goes through a very well marked and very slightly modified gastrula stage is therefore of great theoretical interest, and more so since Salensky, a distinguished Russian embryologist, has proposed in place of the gastrula theory another theory, which is based, in part, upon erroneous observations upon the development of the oyster, which Salensky says does not pass through the gastrula

stage of development at all, but forms a digestive cavity in another way.

"The edges of the primitive mouth of the oyster continue to approach each other, and finally meet and unite, thus closing up the opening, as shown in Fig. 36, and leaving the digestive tract without any communication with the outside of the body, and entirely surrounded by the outer layer. The embryo shown in Figs. 32 and 36 are represented with the dorsal surface below, in order to facilitate comparison with the adult, but in Fig. 37 and most of the following figures the dorsal surface is uppermost, for more ready comparison with the adult. The furrow in which the primitive mouth was placed still persists, and soon a small irregular plate makes its appearance at each end of it. These little plates are the two valves of the shell, and in the oyster they are separated from each other from the first, and make their appearance independently.

"Soon after they make their appearance the embryos cease to crowd the surface of the water and sink to various depths, although they continue to swim actively in all directions and may still be found occasionally close to the surface. The region of the body which carries the cilia now becomes sharply defined, as a circular projecting pad, the *velum*, and this is present and is the organ of locomotion at a much later stage of development. It is shown at the right side of the figure in Fig. 37, and in Fig. 45 it is seen in surface view, drawn in between the shells, and with its cilia folded down and at rest, as they are seen when the little oyster lies upon the bottom.

"The two shells grow rapidly, and soon become quite regular in outline, as shown in Figs. 37 and 44, but for some time they are much smaller than the body, which projects from between their edges around their whole circumference, except along a short area, the area of the hinge, upon the dorsal surface, where the two valves are in contact.

"The two shells continue to grow at their edges, and soon become large enough to cover up and project a little beyond the surface of the body, as shown in Fig. 44, and at the same time muscular fibers make their appearance and are so arranged that they can draw the edge of the body and the velum in between the edges of the shell, in the manner shown in Fig. 45. In this way that surface of the body which lines the shell becomes converted into the two lobes of the mantle, and between them a mantle cavity is formed, into which the velum can be drawn when the animal is at rest. While these changes have been going on over the outer surface of the body other important internal modifications have taken place. We left the digestive tract at the stage shown in Fig. 36, without any communication with the exterior.

"Soon the outer wall of the body becomes pushed inwards, to form the true mouth, at a point (Fig. 37) which is upon the ventral surface, and almost directly opposite the point where the primitive mouth was situated at an earlier stage. The digestive cavity now becomes greatly

enlarged, and cilia make their appearance upon its walls, the mouth becomes connected with the chamber which is thus formed, and which becomes the stomach, and minute particles of food are drawn in by the cilia, and can now be seen inside the stomach, where the vibration of the cilia keep them in constant motion. Up to this time the animal has developed without growing, and at the stage shown in Fig. 36 it is scarcely larger than the unfertilized egg, but it now begins to increase in size. The stages shown in Figs. 44 and 45 agree pretty closely with the figures which European embryologists give of the oyster embryo at the time when it escapes from the mantle chamber of its parent. The American oyster reaches this stage in from twenty-four hours to six days after the egg is fertitized, the rate of development being determined mainly by the temperature of the water.

"Soon after the mantle has become connected with the stomach this becomes united to the body-wall at another point a little behind the mantle, and a second opening, the *anus*, is formed. The tract which connects the anus with the stomach lengthens and forms the intestine, and, soon after, the sides of the stomach become folded off to form the two halves of the liver, as shown in Fig. 44.

"Various muscular fibers now make their appearance within the body, and the animal assumes the form shown in Figs. 44 and 45.

" All my attempts to get later stages than these failed through my inability to find any way to change the water without losing the young oyster, and I am therefore unable to describe the manner in which the swimming embryo becomes converted into the adult, but I hope that this gap will be filled, either by future observations of my own or by those of some other embryologist.

"In my attempt to raise the oyster embryo from the egg, I found that continuous warm weather was essential to success. As my observations upon the developing eggs occupied all my time, I was not able to make any record of the temperature of the water of the ocean, but during June there were a number of cold, windy days and nights, and two hail-storms, and on each of the cold days all the embryo which I had in the house died."

Since 1879, though several persons have been employed upon the work, and Dr. Brooks has also continued his investigations, no material advance in artificial oyster culture has been made, and beyond the additional knowledge of the reproductive process of the oyster, Brooks's experiments have been without practical result.

Concerning the influences to which the eggs, spermatozoa, and spat are exposed, and the conditions necessary to their survival, Dr. Brooks says:

"The most critical time in the life of the American oyster is undoubtedly the time when the egg is discharged into the water to be fertilized, for the chance that each egg which floats out into the ocean to shift for itself will immediately meet with a male cell is very slight, and it is

essential that the egg should be fertilized very quickly, for the unfertilized egg is destroyed by the sea-water in a very short time. The next period of great danger is the short time during which the embryos swarm to the surface of the water. They are so perfectly defenseless, and so crowded together close to the surface, that a small fish, swimming along with open mouth, might easily swallow in a few mouthfuls a number equal to the human population of Baltimore. They are also exposed to sudden changes of temperature, and as my experiments have shown that a sudden fall in temperature is fatal to them at this time, the number which are destroyed by cold rains and winds must be very great indeed.

"As soon as they are safely past this stage, and scatter and swim at various depths, their danger from accidents and enemies is greatly diminished, and their chance of reaching maturity increases hundreds, and probably thousands, of times.

"Although the mortality at these early stages is so excessive, the number of young which pass through them safely without help is very great, and if there were no other dangers and uncertainties there would be no need of measures for their protection. As they swim to and fro in the water, they are carried to great distances by the tides and currents and reach all parts of the region of water in which the parent bed is situated. In a favorable year a floating plank or bush, or piece of drift wood, will be found to become covered with small oysters which have fastened to it, although it may not be within miles of any natural oyster-bank. The fact that the young may be collected in this way in any part of the Chesapeake Bay shows that the young oysters must settle down upon the bottom in nearly all parts of the bay, and we should expect the adults to have an equally general distribution. This is far from the case, and nothing could be farther from the truth than the idea that the bottom of the waters of the oyster regions is uniformly covered with oysters, and that it is only necessary to throw a dredge overboard and drag it along the bottom for a short distance in order to bring it up full. Nothing could be a greater mistake, for both in this country and in Europe the oysters are restricted to particular spots, 'beds' or 'banks,' which are as well defined and almost as sharply limited as the tracts of wood-land in a farming country. These beds are so well marked that they can be laid down on a chart or staked out with buoys; and even in the best oyster regions they occupy such an inconsiderable part of the bottom that any one ignorant of their position would have very little chance of finding oysters by promiscuous dredging. Although the young are distributed every year by the tides and currents to all parts of the bottom, the dredge very seldom brings up even a single oyster outside the limits of the beds.

"The restriction of the oysters to certain points does not appear to depend upon the supply of food, or upon the character of the water, but almost entirely upon the nature of the bottom. The full-grown oyster is able to live and flourish in soft mud, as long as it is not buried

too deeply for the open edge of the shell to reach above the mud and draw a constant supply of water and food onto the gills. The placing of adult oysters upon such bottoms at convenient points to 'fatten' for the market is a well-known practice. The oyster embryo would be ingulfed and smothered at once if it should settle down on such a bottom, and in order to have the least chance of survival and long life the young oyster must find some solid substance to fasten itself to, in order to preserve it from sinking in the soft mud or from being covered by shifting sand or gravel. As soon as the young oyster finds such a solid body, rough and clean, it fastens one valve of its shell to it by secreting a cement of shelly matter around the growing edge.

"The living and dead shells of the adult oysters furnish the best surfaces for the attachment of the young, and for this reason the points where oyster beds are already established are those where the young have the most favorable surroundings and the best chance for life, and the beds thus tend to remain permanent and of substantially the same size and shape.

"The great mortality of the young, after they have fastened themselves to the shells of the adults, is due in part to want of room, in part to the attacks of enemies, in part to accidents, such as the shifting of the bottom, and in part, no doubt, to lack of food. While the supply of organic matter which is carried to them by the water is very great, it is not unlimited, and the amount which each oyster can obtain at any one time is quite small, and if the oysters covered the bottom in sufficient abundance, some of them might fail to obtain a sufficient supply. I do not believe, however, that this ever occurs, for long before the oysters are sufficiently abundant to exhaust the supply of organic matter, their numbers are limited by other conditions. The growth of an animal does not depend upon the supply of food in general, but upon the supply of the least abundant of the necessary ingredients of the food. It is well known that a field that is very fertile will fail to produce a satisfactory crop of a plant which needs some particular food-ingredient which the soil contains in too small quantity. Although food in general is very abundant, the growth of this particular crop depends upon the amount of this ingredient, and while the seed which has been planted yields an abundant crop of young plants, only a few are able to grow up, and these can grow no faster than they can extract this particular ingredient from the soil.

"In addition to organic food, the oyster needs a supply of carbonate of lime to make its shell, and this is supplied to it, in solution, in sea-water. If the shell is thin, or if it is formed very slowly, the danger from enemies and accidents is greatly increased; and those oysters which are able to construct their shells with the greatest rapidity are the ones which survive and grow up. The amount of dissolved carbonate of lime which the ocean contains is unlimited, but the amount which can reach each oyster is not very great; and if all the oysters which attach

themselves were to survive there can be no doubt that they would exhaust the available supply of lime before they failed to obtain enough organic food.

"It is well known that shell-fish of all kinds thrive best when the supply of lime is greatest. The fresh-water mussels which live in streams and ponds where the supply of lime is scanty, grow slowly, and their shells are so thin that they are very subject to accidents, and their numbers are limited; but in limestone regions the shells are large and heavy, and the bottoms of the streams are almost paved with mussels, and it is well known to conchologists that coral reefs and islands are the most favorable regions for the abundant growth of all kinds of shelled molluscs."

The investigations of the United States Coast and Geodetic Survey, in the neighborhood of Crisfield, Maryland, which were coincident with those of Dr. Brooks, led to the conclusion that there is little or no regularity in the recurrence of successful "spatting" seasons, and that all irregularities are due, probably, to variations from the normal temperature and density of the water; the higher the temperature during the spring months the earlier will be the advent of the spawning season, and an increased temperature will also hasten the development of the spat, and of the young oysters after they have become attached. Sudden and extensive changes of density will likewise affect the advent, duration, and success of the spawning, though to a less extent.

Subsequent to the attachment of the animal, changes of the conditions surrounding it are not of so much importance, though naturally such changes will more severely affect the delicate organism of the young oyster than that of the older and more hardened adult.

It is during the first six months of its existence that the oyster is exposed to the greatest danger from its numerous enemies. The thin, delicate shells, from one-sixteenth of an inch to one inch in diameter, are readily bored by the drills, whelks, and other gastropods, or torn off by the crabs, and the immense number of all leaves no room to doubt their destructive effects. As an instance, the inspection of the spat collectors placed in the Big Annemessex River by the United States Coast Survey, shows that during the early months of their existence about 50 per cent. of the young oysters were destroyed.* Naturally, as the animal progresses, it becomes more hardy and better able to resist the attacks of enemies and changes of environment, and on unworked beds, where the oysters are practically in a natural state, the decrease in passing from young growth to mature oysters is about 30 per cent., or about one-third of a given number perish in passing from the first to the fourth year of their existence.

The only essential for securing the attachment of the spat is that the object exposed should be clean. The specimens illustrating attachment show how many and various these objects are; and the formation

* Photographs of this collector are exhibited.

and extension of an oyster-bed are due largely to this ability of the young fry to hold on to anything and everything. The beginning of a bed is probably in most cases accidental. There is an exposure of some object suitable for attachment, to which the drifting embryos cling, and succeeding seasons add to the colony and slowly increase both its population and area; the natural limits are defined by the amount of food and constituents of shell available, the amount of room for development, and the character of surrounding, contiguous bottoms. Oysters cannot live on bottoms not sufficiently consistent to support them; they are unprovided with siphons, or means of locomotion, and if sunk in mud or sand will perish. Neither can they live for long periods out of water unless especially educated for that contingency.

Natural oyster-beds on the American coast are of two classes; worked and unworked beds, each presenting marked features.

The following extracts from the reports of Mr. Winslow to the Superintendent of the United States Coast Survey, describing areas in Chesapeake Bay, indicate the salient features of each class. The beds contrasted are located in Chesapeake Bay and Tangier Sound, an adjacent estuary of the bay.

"Generally speaking, here as in the Sounds, the original beds were formed on the side of the shoals, and wherever there was a sudden change of bottom.

"Whenever the solid beds or 'Rocks' were encountered, they were found to be long and narrow ridges, extending generally in a northerly and southerly direction, except when near Kedge's Strait, where they ran more to the eastward and westward; and we could, in standing across the beds, but rarely obtain more than one or two hauls of the dredge before we were off the 'Rock.' The major axis appears here, as elsewhere, to lie in the direction of the current, and probably all natural extension and growth of any bed are in that direction, the spat being carried backward and forward by the ebb and flow of the tides. The large number of beds near and off Kedge's Strait is probably due to the large number of spat brought out from the Sounds through the Strait.

"The bottom is generally of hard sand covered with sponge and grass. Near Kedge's Strait some mud sloughs were found, and in some cases the substratum of the beds was of clay; but in most of them the stratum of oysters and shells was too thick and hard to be penetrated.

"The beds outside the Sounds have been comparatively free from dredging, and thus present marked differences from those inside.

"They are comparatively longer and narrower, and much more sharply defined. Very few scattered oysters are found near them, and the beds are much more solid, unbroken, and much harder, requiring heavier dredges than those used in the Sounds. The most remarkable difference is, however, in the shape and growth of the oysters.

"On the undredged beds they are long and narrow, with the lower shells very deep and bills very thin and sharp. In no case did we find

any single oysters of any class, but all grew in clusters of from three and four to twelve and fifteen. The shells were clean and white, and free from mud and sand. Generally there was found a tuft of red or white sponge attached to the clusters, and the mature first and second class oysters were covered and the interstices between them filled with those of the third and fourth classes; numbers of barnacles were also found, and some *crepidula*, but *tubicola* were present only in small numbers.

"The oysters found upon beds that have been much worked differ materially, being single and broader in comparison to their length, round and with blunt bills. They are usually dark in color, and have a considerable amount of mud and sand on the shells. The sponges do not appear to be as abundant, and the amount of dredging on any bed may always be known by the appearance of the oysters brought up. Upon an overdredged and almost exhausted bed the oysters will be large and single, blunt-billed, with dirty shells, and with an almost entire absence of sponges, barnacles, and *crepidula;* but the shells will be covered with *tubicola* and bored in many places by the *boring pholad*."*

Aside from the effect of the dredge the growth of the oysters on a bed is influenced by many other circumstances. First, the position and character of the object to which the spat fixes itself have a large influence in shaping the form of the shell.

The growth of the "bills" is always toward the surface of the water, and by examining the series of specimens "of peculiar growth, due to attachment of spat," many instances of the curious effect of this effort of the animal will be noticed. During the early stages the shell grows directly out from the beaks; later, the tendency of the lower valve to assume a convex form becomes more marked, and, should the animal be so attached as to be in a horizontal position, this convexity of the lower valve becomes very prominent. If the attachment is such that the lips of the valves are below the beaks, the shell will begin to take a lateral twist, which will sometimes change the direction of shell-growth as much as 90 degrees. Again, should the spat attach in large numbers to any object and become much crowded, having no room for growth or development, except vertically, then each individual shell will become long, thin, narrow, and with very little convexity of the lower valve. Of such description are the oysters growing on natural, undeveloped banks, where they are found in enormous clusters, of from ten to fifty individuals. Such oysters, more common on the Southern coast than the Northern, are called "cat-tongues" and "knife-blades" by the oystermen. The "raccoon" oyster is also of somewhat similar growth and character.

After having developed to some extent in one locality or position, if the oyster be removed to some other point, where the conditions influencing its growth are changed, corresponding changes in the character and growth of the shell may be expected. These changes are il-

* Photographs of specimens are exhibited illustrating these differences.

lustrated by the series showing "peculiarities of growth due to abnormal influences or change of position subsequent to time of attachment." As shown by some of the specimens, owing to change of position, and the effort of the animal to keep the tips of the valves uppermost, the shell has two and three distinct changes in direction of growth, and these changes are sometimes lateral. as though the shell had always fallen on one side or the other; sometimes dorsal and ventral, as though it had always fallen on one edge or the other; and sometimes the irregular growth is a combination of both. This peculiarity is more frequent in oysters from cultivated than in those from natural beds; but it is more marked when it does occur with the natural oysters than with the cultivated ones. As the cultivated beds are more continuously and systematically raked, probably each oyster is turned over once or twice a year, and seldom has an opportunity for any peculiarity of growth to become decided. The natural oyster, however, is rarely handled much before being conveyed to market, and consequently any unusual growth forced upon it is apt to be very remarkable.

The character of the bottom has not only a very decided influence upon the growth of the beds, but also affects the growth of each individual oyster. The shells from impure, muddy waters, are usually dull colored and soft or friable, and when the bottom is very soft, the long flat growth is the only form that has any chance of survival. Types of this form, the "pinched" oyster of the fishermen, are exhibited. A large amount of soft mud, either in the water or on the bottom, likewise affects the interior shell-layers. Particles of the muddy soil get between the valves and under the mantle, and the animal builds a thin layer of shell over them, causing thus the dark blue and black spots about the edges of the shells and over the interior surface, so noticeable in specimens from muddy localities. These peculiarities are shown in the series illustrating the effects of soft bottoms. Shells from hard bottoms and pure waters are much cleaner and harder in character; the shell layers are thinner and less friable, and the *boreal* form more prominent and frequent.

The rate of growth of the American oyster varies with the locality. Generally speaking, it is slower in Long Island Sound than in the Chesapeake, the northern oysters not being considered fit for market until three or more years old, while in Maryland and Virginia waters they attain a marketable size in a year and a half or two years. They are, however, at that age, quite small and are used for steaming or inferior grades of "packed" stock. The size of the animal at different ages also varies with the locality, as does the quality and flavor; but these last two characteristics are by no means constant, even in the same locality. For instance, oysters from the Blue Point district, or Long Island Sound, may be the best in the market during one winter and the worst during the next. Only actual inspection, each season, can decide the comparative merits of the crop from the various localities.

The beds along the entire coast are subject to nearly the same vicissitudes of climate and other natural conditions, influencing the life of the oysters, and as those viscissitudes are not peculiar to the American beds, nor to the molluscan life alone, they do not require special allusion. The number and character of the enemies and the extent of their ravages depends upon the locality. The manner in which the work of such as belong to the mollusca is accomplished, has already been described; but, in addition to the destructive effects of the various *gasteropods* and bivalves, the oysters, in common with several other shell-fish, have to contend with other foes, belonging to other sub-kingdoms. Chief among these are the star-fishes, and the most prominent of that destructive family is the *Asterias forbesii*, or "green" star-fish. They are described and exhibited in the section of economic echinoderms, &c., and specimens of oysters and star-fish, illustrating the method of attack of the latter, are also exhibited in the molluscan collection. The manner in which the oyster is eaten is described by Professor Verrill, as follows:

"After bending their five flexible rays around the shell so as to partly inclose it, they protrude the lobes and folds of their enormous saccular stomach from the distended mouth, and surrounding the oyster shell more or less completely with the everted stomach they proceed to digest the contents at leisure, and when the meal is finished they quietly withdraw the stomach and stow it away in its proper place."

The star-fishes are very destructive in Long Island Sound, but further to the southward, and in Chesapeake Bay, do less damage.

The several varieties of crabs, especially the *Cancer irroratus* and *Carcinus mænas*, destroy many oysters; usually the young are selected, as they are more vulnerable than the mature animals; the damage by crabs, however, is not nearly so great as that done by the star-fish, and though the Chesapeake region suffers more from this enemy than the northern shores, yet on account of the value of the crabs no steps can or will be taken to lessen their numbers. Two species of fishes, the "Sheepshead" (*Archosargus probatocephalus*) and the "Drum" (*Pogonias chromis*) are destructive to oysters, the latter being especially so. Both fishes are provided with teeth with which they crush the young animals, and both usually swallow them, shells and all. The Drum is the chief depredator, but does not often trouble the beds north of New York. On the New Jersey coast, however, it abounds, and moving in schools, will frequently devastate thousands of dollars' worth of property.

The minor enemies may be described as comprising all forms of animal life, such as the sponges, barnacles, annelids, and various shell-fish, that by their presence on a bed deprive the oysters of food or room for development, or, like the mussels, attract other more directly injurious animals.

The boring-sponge (*Cliona sulphurea*), and the red branching sponge (*Microciona prolifera*) are the principal representatives of the *Spongia*.

The former does direct damage occasionally, by its attack on the shells, but usually it rather prepares the way for other enemies than accomplishes anything itself. The latter is not directly harmful, but growing sometimes in great masses, it not only prevents the food supply of the oyster from readily reaching the animal, but interferes with the attachment of the young brood. Hence cultivated beds should be kept clear of this as well as the boring-sponge.

OYSTER INDUSTRY.

THE FISHERY.

The fishery is regulated by the laws of the various States, the Federal Government exercising no control, and consequently the conditions under which the pursuit is followed are many and various. At the present time the laws relating to the oyster fishery may be said to be based upon one of two general principles. The first, the basis for the regulations of most of the States, considers the oyster beds to be inalienable, common property. Laws based upon this principle are generally of a protective nature, and are in reality regulations of the State, made by it in its capacity of guardian of the common property. The second principle assumes the right of the State to dispose of the area at the bottom of its rivers, harbors, and estuaries, and having disposed of it, to consider the lessee or owner, as alone responsible for the success or failure of his enterprises, and the State in no way called upon to afford him other assistance than protection in legitimate rights. In general terms, under the first principle, the beds are held in common; under the second, in severalty. But one State permits the preemption of an unlimited tract of bottom, and the holding of it in fee: the State of Connecticut. Rhode Island leases her ground for a term of years, at $10 per acre; but the person holding an area has no legal power of disposing of it beyond the limits of the lease. Massachusetts, New York, New Jersey, Maryland, and Virginia, all permit pre-emption of small tracts by individuals for indefinite periods, and on the coast of Long Island the various towns along the shore lease tracts of considerable extent to private cultivators.

Various restrictions are also placed upon the time and manner of conducting the fisheries. Some of the States, noticeably Virginia, prohibit entirely the use of the dredge or scrape; others, noticeably New Jersey, prohibit such use in some localities and permit it in others. All the States, with one exception, prohibit the use of steam vessels or machinery, or fishing by other than their own inhabitants. Connecticut again forms the exception, and quite a large fleet of steam dredging vessels are employed on her beds.

The laws of the various States have several common features. All general fishing is suspended during the summer months. No night fishing is permitted. No steamers are allowed to be used. No pro-

prietary rights to particular areas are given beyond the right to "plant" a limited number of oysters on bottoms adjoining land owned by the planter and peace officers and local authorities are charged with execution of laws relating to the fishery. In a few States or localities, licenses are required to be obtained for each fishing vessel; and in one State, Maryland, a regular police force and fleet of vessels is maintained to support the law. These regulations are easily evaded, except those relating to the steamers and pre-emption of ground. Naturally, no one will put down oysters without being able to protect them; and steamers are too readily detected to make their illegal employment possible. In Connecticut and Rhode Island, the beds being virtually private property, there is no restriction of the fishery, except that it shall not be conducted at night.

The character of the vessel or boat used, depends in a measure upon the means of the fisherman and the constancy of his employment. When the beds are small and worked only at intervals, or where the oysterman is poor, a small boat of any description is used. Dories have the preference on the New England coast, and canoes in the Chesapeake Bay. Sharpies are also used in Long Island Sound. If the beds are extensive, furnishing constant employment, or the oysterman is well-to-do, the size and appointments of the fishing craft are much improved. The character of the oyster ground, its location, and the laws governing the fishing, also influence the type of vessel or boat used. Shoal-water beds, in sheltered localities, where dredging is not permitted, are usually fished from small, open boats; as, for instance, the beds of Rhode Island, south shore of Long Island, sea-coast of New Jersey, and Virginia waters. On the other hand, beds lying in deep water, in exposed positions, and where dredging is allowed, are worked by larger craft of 10 to 40 tons, or steamers; as is the case in Long Island Sound, Delaware and Chesapeake Bays. One of the foregoing conditions also decides the implement to be used; when permitted, it is the dredge—either the enormous one employed by the steamers, the smaller toothed rake-dredge, or smooth-scrape. When dredging is prohibited, the tongs, or nippers, with two handles, sometimes 30 feet long, are used.

The dredges are usually worked by an apparatus termed a "winder." Many forms of "winders" (a winch especially adapted for this purpose) are employed, but the one exhibited is the best and has the latest improvements. It is so designed that if, while reeling in, the dredge should "hang," that is, become immovably fixed by some obstruction on the bottom, the drum is at once automatically thrown out of gearing, and the dredge-rope allowed to run out; the sudden and rapid reverse revolution of the brakes, which has caused many serious accidents and considerable loss of life, is thereby prevented. Small craft use a more simple and less expensive description of winch, and frequently haul in by hand, while the steam dredgers have powerful machinery adapted for this special purpose. The number of men employed varies with the size of the craft;

two, three, and four men are sufficient on board the smaller dredgers, while the larger carry ten and twelve. The average sized "pungy" in the Chesapeake has a crew of seven or eight, and the majority of the "tonging" canoes employ one man and a boy.

In the Chesapeake each haul of the dredge is "culled", that is, the oysters are separated from the shells and refuse, as soon as the dredge is on deck, and everything except the oysters is immediately thrown overboard. In Long Island Sound, however, and on all private beds, the culling does not take place until the end of the day, when all shells, or other matters suitable for "stools" or "cultch," are put on the shell-heaps on shore for subsequent use, and no refuse matter is thrown back on the beds. In each locality the policy is unchanged when the fishing is conducted by means of the tongs, and the difference illustrates the degree of care exercised on private and public beds.

The fishermen, as a rule, are of the lower class and generally very ignorant. The masters of the larger vessels employed in the Delaware and Chesapeake are more intelligent, and the oysterman of the Northern and Eastern States is superior in circumstances and education to those of the Southern States. The "tongers" in both sections are better to do in the world, generally owning their boats or canoes and working for their own profit, than the men engaged on the larger dredging vessels who are not above the ordinary day-laborer in condition.

The packing trade is common to the whole seaboard, but the steaming and canning industries are confined mainly to localities south of the Delaware. A general description of each will give a sufficiently exact idea of the methods employed, there being but little local variation.

While a great many oysters are transported in the shell to markets distant from the seaboard, the largest part of the inland consumption is of "opened" or "shucked" oysters, and nearly every oyster dealer along the coast employs a larger or smaller number of persons to open the oysters and pack and ship the meats. Some of these establishments are small, having as few as half a dozen people engaged; others are large buildings or sheds, and employ hundreds of "shuckers." At some points—for instance, Fair Haven, Conn., and Crisfield, Md.—the shores of the rivers are lined with long whitewashed sheds extending back from the wharves; and it is within these sheds that the "shucking" takes place.

The usual arrangement is as follows: The building is divided off in long alleys; on each side of each alley are numerous stalls, each fitted with a "shucking trough," or box-like receptacle for the oysters in the shell. In the trough are two buckets, one to contain the oysters of ordinary size, the other the large "extras;" a block of wood with a flat piece of iron set in it, with its edge up, on which to break the bills of the oyster; a hammer for the same purpose, and an oyster knife. A workman or woman is supplied to each stall and stands in front of, and facing it, the feet and legs being protected and kept clear of the increas-

ing pile of shells by a wooden shield. Men and women, white and black, are employed, but in well-arranged houses the sexes are assigned different alleys, and in many the same distinction is observed with regard to the races. The buildings are roughly put together and are necessarily dirty, sloppy, and uncomfortable, usually being but imperfectly heated by large stoves. The shucking troughs are supplied with oysters from the lots received during the previous day and night, each shucker informing the foreman when his trough is emptied. The same men and barrows that carry the oysters from the vessels or piles to the shuckers, remove the shells that collect on the floor. In shucking, the workman takes an oyster from the heap in the trough, and holding it in the palm of his left hand, the bills projecting and towards him, and with the knife and hammer in the right hand, he lays the lips on the beveled edge of the iron projecting from the block of wood, and with a blow of the hammer breaks off the bills; the knife is then entered, the valves separated, and the oyster removed and thrown into one of the buckets. In Rhode Island and some parts of New England the hammer and block are not used, but the oyster is "stabbed"; that is, instead of breaking the lips of the valves, the knife is entered at the side and the abductor muscle cut. When his bucket is full the shucker carries it to the end of the alley and pours its contents into a trough leading through a hole in the partition dividing the shuckers from the receivers. The oysters are thus run into a sheet-iron or zinc receptacle called the "skimmer," which is perforated with holes to allow the liquor to run off, and are there cleaned of shell fragments and measured. Each shucker has a number, which he gives as he empties his bucket; at the same time he receives a tally-check and his gallon is scored up to his credit on a huge blackboard. At the end of the day the amount of each score is entered in a book, and the employés are paid at the end of the week. Shuckers make from 75 cents to $1 per day in the Maryland houses, and about 50 cents more in the New England establishments. The men usually make more than the women.

From the "skimmer" the oysters are put into enormous tubs, and from thence are taken, a few gallons at a time, to the "cullender," a sheet iron or zinc basin, perforated with small holes, where they are thoroughly washed. From the cullender they are transferred either to small cans, holding a quart of oysters, or to barrels, kegs, or tubs; when packed in tubs, kegs, or barrels, they go in bulk, with a large piece of ice; when packed in the tin cans, the cans are arranged in two rows inside of a long box, a vacant space being left in the center, between the rows, in which is placed a large block of ice. The cans are carefully soldered up before packing, and together with the ice are laid in sawdust. Oysters packed in this way can, in cool weather, be kept a week or more, and sent across the continent, or to the remote western towns.

The steaming process is that by which the "cove" oysters are prepared. The term "cove" is applied to oysters put up in cans, hermet-

ically sealed, and intended to be preserved an indefinite time. The trade in "coves" is confined principally to the Chesapeake region, and the process of preparing them is as follows: The oysters, usually the smaller sizes, are taken from the vessels and placed in cars of iron frame-work, 6 or 8 feet long. These cars run on a light iron track, which is laid from the wharf through the "steam-chest" or "steam-box" to the shucking shed. As soon as a car is filled with oysters (in the shell) it is run into the steam-chest, a rectangular oak box, 15 to 20 feet long, lined with sheet iron and fitted with appliances for turning in steam; the doors, which work vertically and shut closely, are then let down, the steam admitted, and the oysters left for ten or fifteen minutes. The chest is then opened and the cars run into the shucking shed, their places in the chest being immediately occupied by other cars. In the shed the cars are surrounded by the shuckers, each provided with a knife and a can arranged so as to hook to upper bar of the iron frame-work of the car. The steaming having caused the oyster shells to open more or less widely, there is no difficulty in getting out the meats, and the cars are very rapidly emptied. As soon as each shucker fills his can he turns in the contents and receives his tally-check. The oysters, as they are received, are washed in iced water and then transferred to the "fillers'" table, where they lie in great heaps. The "fillers," usually girls, are employed in filling and weighing the round tin cans, which are such familiar objects in every grocery. The cans, having been filled, are removed to another part of the room and packed in a cylindrical, iron crate or basket, which will hold six dozen or more of them. When the crate is full it is lifted by means of a derrick and lowered into a large cylindrical kettle, called the "process kettle" or "tub." The lid of the "process kettle" is then closed and screwed down, and the oysters again steamed. After this second steaming they are placed, crate and all, in the "cooling tub," a rectangular tub containing cold water, and when sufficiently cool to be handled, the cans are taken to the "cappers," or soldering table, and there "capped;" that is, are hermetically closed. From the "cappers" they are transported to another department, labeled and packed in boxes for shipment. The whole steaming process will not occupy an hour from the time the oysters leave the vessel until they are ready for shipment.

The only other branch of the industry not yet alluded to, is "planting," and as this varies with the different States, it is considered in detail. For the capital invested, number of bushels produced, and persons employed, see the "statistical" table at the end of the pages devoted to the oyster.

Maine.—This State is noteworthy on account of her past rather than her present resources. At Damariscotta, and the Sheepscot River, great shell-heaps exist, composed mainly of oyster shells of gigantic size; but there is, at the present day, but one small natural bed, situated some few miles west of Damariscotta. In Portland Harbor, or Casco Bay, a few hundred bushels of oysters, that are brought from the Chesapeake,

or Long Islan l Sound, are laid down on the flats in the summer to fatten. They will not live through the winter, and usually are not allowed an opportunity to attempt the experiment.

New Hampshire.—There was, until lately, a large natural bed in this State, in the Piscataqua River, but over-fishing has caused its practical extinction. Oysters are supplied the market by importation from other localities, either directly, in kegs or tubs, or in the shell by the cargo. In the latter case, the animals are "laid down" for the summer months in the Piscataqua.

Massachusetts.—North of Cape Cod, no natural oyster-beds of any importance occur; though at the mouths of the various rivers and at Wellfleet, on Cape Cod, they have existed in the past. The extinction is supposed to be due to climatic changes and over-fishing. A few oysters from other localities are "bedded" or "laid down" in the spring and summer months, but most of the market supply is derived from direct importations, either in the shell or opened. Quite an important trade in the latter class is carried on between Boston and Norfolk, Va., amounting in 1880 to 250,000 gallons. South of Cape Cod, in Buzzard's Bay, are many natural beds, and quite a flourishing business is carried on in their vicinity; but this is owing in a large degree to the system of cultivation of private beds. The general practice is to take the oysters from the natural banks and deposit them on the private ones, to grow and fatten; shells are also deposited to catch the drifting spat, but the success of the latter method has not been so great as elsewhere. Oysters are also imported from other localities for "bedding" or "laying down," but unless from adjacent States, they do not do well or outlive the winter. The laws regulating oyster planting and farming, permit town and city authorities to grant licenses to work tracts of bottom for twenty years. The extent of tracts is not limited, except that they shall not include any natural bed. Night fishing is not permitted, and infringement of the rights of the person holding the license is punished by a fine of not more than $100 and imprisonment of from thirty days to six months.

Rhode Island.—The natural beds of this State are neither extensive nor exceedingly prolific. They lie principally in the Seekonk River, a branch of the Providence River, and in Cole's and Kickamuit Rivers. The "natural growth" are rarely used in the markets, but are taken in great numbers when young and placed on the private artificial beds, located, for the most part, in the Providence River. The Seekonk furnishes between five and ten thousand bushels of "seed" annually, and two years' growth on an artificial bed makes them marketable. A large number of oysters are also imported from Long Island Sound and the south shore of Long Island for the purpose of "seeding" beds. This process is simply to purchase young oysters, about a year old, and spread the cargo as evenly as possible over the area to be "seeded." This is frequently supplemented by spreading shells of oysters or scallops over and about the area during the early summer months, and with them a

number of "mothers," or large oysters about to spawn. Usually 100 bushels of "mothers" to 4,000 bushels of shells are put down. Great success has frequently followed the adoption of this system; but many failures have also occurred, the causes for which are obscure.

The "bedding" or fattening of "Virginias," or Southern oysters, is the most profitable part of the business in this State, and about 500,000 bushels are laid down annually. They do not live through the winter, nor can they stand the voyage north during the summer; consequently, the laying down is done in the spring, and the oysters are sold during the autumn.

The laws governing the private oyster-beds permit the leasing, by any inhabitant of the State, ground below tidewater mark, and outside of harbor lines, for five to ten years, at an annual rent of $10 per acre; prohibit fishing at night, and punish infringements of the rights of leesees by fine and imprisonment. About 1,000 acres are at present under cultivation under the above regulations.

Connecticut.—Like Rhode Island this State has no natural oyster-beds that are of important size or productiveness, when compared with her artificial, private beds. Such as exist are larger and more numerous in the western waters than in the eastern. Like the Rhode Island beds they are fished principally for "seed" for the private areas. The system of cultivation in this State is similar, in all essential points, to that described in Rhode Island, but is much more extensively adopted, the area under cultivation being enormous. More attention is given to "planting" shells and other suitable cultch than in Rhode Island, and the farms differ from those of the other State in lying, generally, in much deeper water. The Rhode Island planters seldom work in water of more than three fathoms depth, while the Connecticut men are throwing shells and oysters over in five and six, and even deeper water. Another feature is the selection by the latter class of hard bottoms in preference to any other. The use of steamers and the constant raking and cleansing of the beds is another distinguishing characteristic of Connecticut oyster growers. Large importations are made from Virginia and other waters, for fattening and bedding, and the business in this particular is entirely similar in methods to that of Rhode Island, and about the same quantity of oysters are imported. The native oyster business, however, greatly exceeds the other, both in value and volume, and its large increase and success are due entirely to the system of cultivation adopted and the laws protecting it. In this region, in planting a new area, about 1,000 bushels of "spawners" (mother oysters) are put down, to 7,000 or 8,000 bushels of shells. The spawners are put over in May, about 40 bushels to an acre, and the shells or "cultch" in July; young seed oysters are sometimes added. The expense is not great, averaging about $40 per acre, and the yield per annum is usually double that amount.

The laws governing oyster planting and farming permit the purchase, at $1 per acre, of unlimited areas, by residents of the State, provided no

natural oyster bed is included. The ground is taxed as is also the crop. At the present time some 20,000 acres have been disposed of.

New York.—Throughout the waters of this State are numbers of natural oyster-beds, but all are in a more or less impaired condition and would by no means supply the demand if their efforts were not supplemented by cultivation and importation from New Jersey and Delaware and Chesapeake Bays. These importations are made directly, the oysters coming in the shell, or opened, or are brought in cargoes and "bedded" or "laid down" to fatten. A very prevalent method in this region and to the southward, is to put oysters in fresh or slightly brackish water before selling them. They are thus swollen and appear fatter and plumper. The methods of cultivation are similar to those of Connecticut and Rhode Island, though on the south shore of Long Island not much dependence is placed upon foreign stock, while in the East River there is considerable importation from other localities of "seed" and "spawners." The cultivation of private beds is regulated to a great extent by the authorities of the towns. The State law permits the pre-emption of tracts for an indefinite period, the length depending upon the continuity of the cultivation, and prohibits the use of steam vessels. Along the north shore of Long Island these tracts are held on such uncertain tenure that no very extensive or remunerative business can be done; but on the south shore of the island a better system is in operation, and especially in Great South Bay, (Blue Point district) the oyster farms flourish. The practice there is to lease the ground at a rent of $1 per annum for each acre. Taxes are also laid on the floating property and stock on the beds. The town of Brookhaven, in whose jurisdiction these beds lie, received an income of about $1,500 from the cultivators in 1880, and 371 acres were occupied. No dredging is allowed, and natural beds are common to all residents of the town. These beds are, however, being fast depleted of their stock, and the supply is gradually failing.

The laws of the towns to the westward, on the south shore, generally permit planting, but only by residents; a rent of from $1 to $5 per acre is required, and no dredging permitted.

New Jersey.—This State has many extensive, natural oyster beds, both along the seaboard and in Delaware and Newark Bays; but the natural-bed oysters rarely go directly to market. The usual custom is to transplant them for a season to water and bottom differing from that of their original locality. The Shrewsbury oysters are instances of the good effects of this system. "Natural growth" is exceedingly rare in those waters, and the celebrated stock comes originally from Newark Bay and the south shore of Long Island. There is considerable planting of "Barnegat seed" (small oysters, indigenous to Barnegat Inlet) all along the seacoast; but "shelling" areas in hope of attracting spat is seldom attempted, such areas being regarded as public property. Most of the inhabitants of the shores have, however, areas of more or less extent under cultivation, and the practice of "freshening" the oysters

by exposing them to fresh water for a short period is prevalent. The planting of Southern (Chesapeake or Virginia) stock is mostly confined to the Cape May district and Delaware Bay, and most of the plants come from the seacoast, about Chincoteague. The regulations governing the fishery are made by the towns or counties, and generally permit the leasing, for limited periods, of small areas to residents only. The State law prohibits the use of the dredge and pre-emption of natural beds.

In the Delaware Bay the law permits the leasing of larger areas and the use of the dredge. Dredging vessels are licensed at $1 per ton. A "collector" and "special officer", who execute the laws and collect dues and fines, are elected by the persons leasing oyster lots. One-half the money from licenses, property sold, and fines goes to the "oyster fund," which is devoted to paying the expenses of guarding the leased beds. The "seed" for these tracts comes usually from the natural beds, but some is also imported from the Chesapeake and Virginia seacoast.

Delaware.—The natural oyster beds of this State lie on the western side of Delaware Bay, and, though formerly very productive, do not now yield a large crop. Probably 500 acres comprises the total productive area. The State law permits the pre-emption of tracts of 15 acres of "free bottom" for $25. Natural beds are exempted, and citizens of the State alone are permitted to "plant" oysters. An oyster guard-boat is provided, with officers and crew, and regulations governing the close-time, night-fishing, &c., are enforced. The natural beds are worked continuously for "seed," but the major portion of the "planted" oysters come from the Chesapeake. The oysters are culled as dredged, but the "seed" and small oysters are transferred to the "idle-ground," a tract where "seed" is growing, instead of being thrown back on the planted bed. The plantations are located off Little Creek Landing, and no natural beds legally exist, south of a line drawn eastward from Mahon River, except in less than 3 feet of water.

Maryland.—The oyster business of this State is practically confined to dredging the natural beds that exist to an enormous extent in Chesapeake Bay and its tributaries. There is little or no planting or cultivation, the natural areas having in the past supplied all the demands; but of late those areas are becoming much exhausted, and the diminished quantity and quality of the oysters is causing great complaint.

The laws which govern the fishery are, briefly, as follows: Dredging is allowed from October 1 to May 1. Taking of oysters in other ways from September 1 to May 1. Dredging is not allowed in the rivers or creeks, or in their mouths. No steam dredges are allowed. All dredgers and "tongers" must be licensed. Violations of the law are punished by not more than two years imprisonment nor $200 fine. For the enforcement of these regulations there is established a State fishery force, consisting of one steamer and several small sloops. The officers of this fishery force and the sheriffs and constables of the different counties are empowered to make arrests and enforce the law.

"Tonging," that is, taking oysters by tongs, is permitted at any point, and small tracts of bottom, contiguous to the land of the person desiring to plant or cultivate oysters, may be secured for that purpose; very little in that line is, however, attempted.

Virginia.—This State has also extensive natural oyster beds, and, consequently, but little attention is given to planting and cultivation. Dredging is no longer allowed, but the law on that point is frequently disregarded by the lawless dredging vessels of the bay. A certain amount of a rude species of cultivation is carried on, consisting merely in transplanting oysters from one locality to another, but the yield is inconsiderable when compared with that of the natural beds. These, like the Maryland areas, are fast being exhausted by the excessive fishery. No "fishery force" is maintained, and the law is enforced by local peace officers, occasionally assisted by the militia of the State.

None of the remaining Southern States are important oyster centers. The fishery is confined to supplying the local demands, and no packing or canning is attempted. As a general thing the natural beds afford as many oysters, and those of as good a quality, as is desired. In the neighborhood of Charleston, South Carolina, Mobile, Alabama, New Orleans, Louisiana, and Galveston, Texas, a rude system of cultivation, similar to that of Virginia, is carried on to a limited extent.

On the Pacific coast, cultivators have made many attempts to introduce the Eastern oyster or that from Mexican waters, but without material success. The Eastern variety will live and increase in size, but does not breed, and unless the supply is continually augmented by fresh importations from the East the planted beds gradually die out.

The following statistical summary from the United States Census Report shows the volume of the oyster industry of the whole country.

Table showing, by States, the persons employed, capital invested, and value of products in the oyster industry.

States.	Grand total.			Persons employed.		Apparatus and capital.		
	Number of persons employed.	Bushels of oysters produced.	Value of oysters as sold.	Fishermen.	Shoresmen.	Total capital invested in oyster industry.	Number of vessels.	Value of vessels.
Total	52,805	22,195,370	$13,438,852	38,249	14,556	$10,583,295	4,155	$3,528,700
Maine	15	.....	*a* 37,500	5	10	4,210	1	3,000
New Hampshire	9	1,000	6,050	6	3	2,400	.....	.....
Massachusetts	896	36,000	405,550	409	487	303,175	56	227,000
Rhode Island	650	163,200	356,925	300	350	110,000	.....	.....
Connecticut	1,006	336,450	672,875	672	334	361,200	100	69,000
New York	2,724	1,043,300	1,577,050	1,958	766	1,013,060	426	397,000
New Jersey	2,917	1,975,000	2,080,625	2,605	312	1,057,000	575	530,000
Pennsylvania	.....	.....	*a* 187,500	.....	.....	.....	.....	.....

a This quantity represents only the enhancement, the first cost being included in the Maryland and Virginia statistics

Table showing, by States, the persons employed, capital invested, &c.—Continued.

States.	Grand total.			Persons employed.		Apparatus and capital.		
	Number of persons employed.	Bushels of oysters produced.	Value of oysters as sold.	Fishermen.	Shoremen.	Total capital invested in oyster industry.	Number of vessels.	Value of vessels.
Delaware	1,065	300,000	$687,725	820	*a* 245	$145,500	65	$50,000
Maryland	23,402	10,600,000	4,730,476	13,748	*b* 9,654	6,034,350	1,450	1,750,000
Virginia	16,315	6,837,320	2,218,376	14,236	*c* 2,079	1,351,100	1,317	460,950
North Carolina	1,020	170,000	60,000	1,000	20	68,500	90	22,500
South Carolina	185	50,000	20,000	175	10	12,250	10	2,500
Georgia	350	70,000	35,000	300	50	18,500	.....	.....
Florida	166	78,600	159,50	140	26	22,000	.....	.....
Alabama	300	104,500	44,950	250	50	16,000	20	6,000
Mississippi	60	25,000	10,000	50	10	3,000	.....	.....
Louisiana	1,400	295,000	200,000	1,300	100	36,750	45	10,750
Texas	240	95,000	47,300	200	40	17,750	.....	.....
Washington Ter.	85	15,000	45,000	75	10	6,550	.....	.....

States.	Apparatus and capital.				Products.		Enhancement of value of oysters in process of preparation for market.*d*	
	Number of boats.	Value of boats.	Value of gear and outfit.	Value of shore property.	Bushels of oysters produced.	Value of same to producer.	Number of bushels.	Amount of enhancement.
Total	11,930	$708,330	$712,515	$5,633,750	22,195,370	$9,034,861	13,047,922	$4,368,991
Maine	3	60	150	1,000	.....	.....	75,000	37,000
New Hampshire	5	300	100	2,000	1,000	800	7,000	5,250
Massachusetts	117	9,485	10,690	56,000	36,000	41,800	514,000	363,750
Rhode Island	100	14,500	5,500	90,000	163,200	225,500	274,300	131,425
Connecticut	563	33,165	19,385	239,650	336,450	386,625	515,000	286,250
New York	1,714	121,700	42,460	451,900	1,043,300	1,043,300	1,065,000	533,750
New Jersey	1,400	110,500	91,500	325,000	1,975,000	1,970,000	237,500	110,625
Pennsylvania	.....	.....	.....	.....	.....	.....	*g* 250,000	137,500
Delaware	300	12,000	10,000	*e* 73,500	300,000	325,000	*h* 834,500	*i* 362,725
Maryland	1,825	130,520	161,480	*f* 3,992,350	10,600,000	2,650,000	7,653,492	2,080,476
Virginia	4,481	224,050	329,250	*j* 336,850	6,837,320	1,948,636	1,622,130	269,740
North Carolina	800	16,000	15,000	15,000	170,000	60,000	.....	.....
South Carolina	100	2,500	2,250	5,000	50,000	20,000	.....	.....
Georgia	100	10,000	3,500	5,000	70,000	35,000	.....	.....
Florida	110	8,000	2,000	12,000	78,600	15,950	.....	.....
Alabama	42	4,000	3,000	3,000	104,500	44,950	.....	.....
Mississippi	40	1,000	500	1,500	25,000	10,000	.....	.....
Louisiana	120	3,000	13,000	10,000	295,000	200,000	.....	.....
Texas	70	6,750	2,000	9,000	95,000	47,300	.....	.....
Washington Ter.	40	800	750	5,000	15,000	10,000	.....	.....

a Of these, 215 are employed in the canneries at Seaford.
b Of these, 8,864 are employed in the various canneries.
c Of these, 1,578 are employed in the canneries.
d This includes planting, bedding, fattening, and transportation to distant markets in oyster-vessels.
e Of this, $28,500 is invested in the cannery interests at Seaford.
f Of this amount, $2,492,350 represents the cash capital invested in the cannery industry.
g Brought in winter by vessels registered in other States, the men engaged and the value of the vessels being accounted for elsewhere.
h Of these, 184,500 bushels were packed at Seaford, and 650,000 bushels were planted in Delaware Bay.
i Of this, $22,225 represents the enhancement on those canned.
j Of this, $119,350 represents the cash capital in the cannery interests, and $167,500 the value of buildings and fixtures for canning.

Mya arenaria, Linne.

This is the "clam" of the Massachusetts coast. The "long," or "soft clam," of Long Island Sound and the Middle States, and the "Mananose" of the Southern States. Its range is from the Arctic Ocean to South Carolina, but it is rare south of Cape Hatteras. It is particularly large and abundant in Long Island Sound, and is also found on the coasts of Alaska and California. It is fossil in the Post-Pliocene formations of New England and the Southern States, and also in the Miocene of Maryland. This species, though found on sandy shores in the littoral zone, prefers a bottom where there is a mixture of mud or gravel, or both, with the sand. It lives on outer beaches, but not in loose sands, and generally is most abundant in the sheltered bays and estuaries. Its burrows are permanent, and it is usually buried a foot or more below the surface, its long siphons enabling it to reach the necessary food and oxygen at that distance. The specimens of this shell taken from outer sandy beaches are thinner, whiter, and more regular in form than those found in the estuaries; they are also covered with a thin, yellow epidermis. The specimens from the estuaries are rough, mud-colored, and homely, and might easily be mistaken for another species. The spawning season is during the spring or early summer months; the process of reproduction has not yet been studied, and no definite information is available regarding the embryonic or early life of the animal. After they become perceptible, however, they are found anchored to the bottom by a slender byssus, and at a very early stage of growth the foot is developed, and with it the animal's power of burrowing. They usually exist in communities, or beds, on the flats, sinking themselves deep in the sand and mud during the winter, and coming nearer the surface as the warm weather approaches. "The clam" is eaten extensively in the neighborhood of the Bay of Fundy, and the shell-heaps bear evidence that this consumption is not of recent date, but that the *Mya arenaria* furnished the Indians with food centuries ago. Extensive beds occur at intervals along the coast of Maine, and the mouths of all the rivers and estuaries contain this clam to more or less extent. It is indeed the most important shell-fish of the State, and the annual yield is estimated at nearly 316,000 bushels, valued at about $88,472.

The Massachusetts fishery is the one of most consequence, and the whole coast of that State was at one time saturated with clams, the young sometimes being so abundant as to whiten the beaches and flats; of late years, however, this abundance has not been so marked, and the clams are disappearing through overfishing. They are ordinarily taken by digging, but on the flats north of Boston, and in the neighborhood of Plymouth and Duxbury, at one time they were so plentiful that plows were used in turning them up to the surface.

Though the *Mya arenaria* is taken to a small extent in Buzzard's Bay, the next point of importance is Narragansett Bay and the Rhode Island

shores. While in Massachusetts Bay the profitable season is during the summer months, in Rhode Island the winter's fishing brings in the largest return; a large number of the inhabitants of the shores being engaged during that season in securing soft clams. The whole coast of Long Island Sound is prolific, and one or two points are especially noted for the abundance, or superior size and quality, of the clams usually found. Guilford, on the Connecticut coast, is especially prominent, the clams from that vicinity sometimes being 6 and 8 inches long, a pound or more in weight, and retailing in New Haven markets for $1.25 per dozen. These clams are, however, only obtained at extremely low tides and are comparatively scarce. About 10,000 of the ordinary size are taken per annum, and are sold at from 40 to 60 cents per dozen. All along the southern shore of the sound are prolific clamming grounds, the principal product of the fishery being shipped to New York. The south shore of the island, especially Rockaway Bay, also sends its quota to supply the New York market. New York and Newark Bays formerly supplied large numbers of soft clams, but of late years those areas have ceased to yield anything of consequence. Along the Jersey coast the annual yield is about 70,000 bushels, valued at about $29,500. Southward of New Jersey the *Mya arenaria* ceases to be of commercial importance, being eaten only by the negroes and a few of the inhabitants of the shores.

During the last few years this mollusk was carried out from the East to San Francisco Bay, apparently by accident, with a cargo of oysters intended for transplanting. Those taken out, however, were sufficient to abundantly stock the bay, and the soft clam is now found there in large numbers.

There is very little in the methods of taking this species that calls for peculiar apparatus or appliances. A spade and bucket are the usual implements at the present day, the use of the plow having been but local, and abandoned when the abundance of the crop decreased. At Bridgeport, Conn., it is still used by Mr. Hawley, but only in cultivating; he having instituted a system of cultivation on a scale of considerable magnitude. His method is, briefly, to plow long furrows in the flats, and lay his clams in them, some 6 or 12 inches apart. Some five years or more are necessary before the crop is realized, but it then pays exceedingly well.

The soft clam is very seldom eaten raw, but is cooked in a variety of ways, usually as soup or chowder, and frequently fried. Some dealers pickle them, and a small number are salted. They are to be bought in the markets of any of the Middle or New England States, raw, and are usually sold in strings of a dozen connected by a cotton cord.

While extensively eaten, the larger portion of the annual crop is utilized as bait by the cod and mackerel fishermen. Unless the prospective fishing voyage is short, the clams used for this purpose are removed from the shell, salted, and packed in barrels; but when only a short trip is

undertaken, they are carried fresh in the wells or packed in ice. The saltings are of two kinds: "full salting" and "slack salting," or "covering." In the former method one bushel of salt is allowed to each barrel; in the latter, only from half a peck to half a bushel. About 12 bushels of clams will make a barrel of salted bait, which is valued at $4. The practice of taking mackerel in seines, and the use of the trawls in the cod fishing, which are not baited with clams, is interfering with this branch of the soft clam industry; but it is still of considerable importance.

The following is a summary of the annual product of the fishery, and its value:

Total number of clams (*Mya arenaria*)	164,195,200
Total number of bushels	835,974
Value per bushel (average)	$0.395
Total value annual product	$330,523.24

Mactra solidissima, Chemnitz.

This bivalve is the *Mactra gigantea* of Lamarck, the *Mactra similis* of Say, and the *Spisula solidissima* of Gray and other writers. It is known commonly as the "sea," "surf," or "hen" clam, the various designations being applied indiscriminately. It exists from Florida and the Gulf of Mexico to Labrador, and is abundant along the entire coast. It is found fossil in the Post-Pliocene of Massachusetts, and apparently in the Miocene of the Carolinas. The *Mactra solidissima* properly belongs to sandy shores, and is not often found elsewhere, the only other locality it seems to favor being the gravelly and shelly bottoms of bays and sounds, where it is common and of great size. It exists in sheltered waters and on open beaches, and generally from low-water mark to 5 and 6 fathoms. It is very abundant and large on the outer beaches of New Jersey and south side of Long Island. The shells vary greatly both in size and form; they may be oval, elliptical, triangular, compressed, or swollen, and are sometimes more than 6 inches long and 5 broad. As the siphon-tubes are very short, it does not burrow very deeply, though its large and muscular foot enables it to do so quickly. Large numbers are thrown up on the beaches by every storm, to be utilized as food by the birds, and as manure by man.

The "sea-clam" is not of commercial importance south of New Jersey, and probably is more extensively sought in the Cape Cod region than elsewhere. There they are worth $3 per barrel, but sell in the Boston market, when fresh, at $4; in New York markets they are rare. Their consumption as food is confined to the coasts principally, owing to the ease with which the superior "long clam" and "round clam" can be obtained, and on account of the toughness of the flesh of the large animals. The young of this species are, however, quite equal in flavor and quality to any clam of the coast.

While not holding a high place as an edible mollusk, the sea-clam

occupies an important position in the bait-supply of the "Banks" fishermen, and is sought mainly for that purpose. The clams are secured by means of heavy, variously shaped, iron rakes, having from 15 to 25 large teeth, and fitted with wooden poles or handles from 20 to 30 feet long. The fishing is carried on at low water in depths of about 8 feet, and the catch is worth from 25 to 28 cents a bushel. The clams are salted, packed in barrels, and dispatched to the various fishing ports, such as the towns on Cape Cod, Boston, and Gloucester. About three-fourths of the annual crop goes to Boston. In the fall 16 bushels of clams are required to fill one barrel with "meats"; but in the spring only 12 bushels are necessary. The actual cost of a barrel of clams, salted and packed, in Boston, is about $5.75. The shells are also sold at 5 cents a wagon-load, and used for road-making. The capital invested in the business was, in 1880, $10,000, and between 250 and 300 boats were employed.

Cyprina islandica, Lamarck.

This clam is the "sea-clam" or "false quahaug." It is found in deep water, from Block Island to the Arctic. In depth it varies from 6 to 100 fathoms. It has not been found yet as a fossil in North America.

The *Cyprina islandica* is rarely eaten, indeed rarely found, but is available for food or bait. It is easily distinguished from the true quahaug (*Venus mercenaria*) by its brown epidermis.

Ensatella americana, Verrill.

This is one of the species of the genus *Solen*, and has been variously designated as *Solen ensis* and *Solen americanus*, by Gould, DeKay, Adams, Linné, and others. It is the "razor-clam" or "razor-fish" of commerce; and is also called the "razor" and "knife-handle." Its distribution is extensive, the animal being found from Florida to Labrador, and it is common along the whole coast, especially in Long Island Sound, and at Great Egg Harbor, New Jersey. It is fossil in the Post-Pliocene deposits of Maine, Massachusetts, Virginia, and South Carolina, in the Pliocene of South Carolina, and in the Miocene of Maryland, and North and South Carolina.

The *Ensatella americana* is an inhabitant of sand flats and bars, where the water is pure; it is found also, though not so commonly, on the outer sand-beaches of the coast, but generally prefers more sheltered localities. It usually exists at or just below low-water mark, and its large elliptical-shaped burrows, extending 2 or 3 feet into the sand, are easily recognized when the tide is out. If the holes are approached with care at such times, an inch or two of the shell can be seen projecting above the surface; but the slightest jar of the sand is sufficient to send the whole colony to the bottoms of the burrows; and the alarm once given it is useless to attempt to dig them out, for the animals can

penetrate the sand much faster than the spade can follow them. Even when partially uncovered they often hold themselves so firmly in the holes by means of their muscular foot, that the body can be entirely withdrawn from the shell before the hold is relaxed. As their siphons are very short, they are obliged to come to or near the surface in order to obtain the necessary supplies of oxygen and food. Therefore, though the animal may be out of sight, yet it is probably only sunk a short distance in the sand, and a sudden thrust of a spade obliquely across the direction of the burrow will frequently unearth the clam. The disadvantages of the short siphons are, however, made up by the great activity of the animal and the wonderful power of its foot, which is its excavating implement and organ of locomotion.

The razor-clam is eaten to some extent along the coasts of Long Island, Long Island Sound, Massachusetts Bay, and coasts of New Jersey. It is to be found in the New York markets, but the trade is not extensive, the sweetish flavor of the flesh being unpalatable to the majority of people. It is used as bait, also, especially about Cape Cod and on the south shore of Long Island, and is devoured by several fishes, such as the skates and tautog, that seem to have the power of rooting it out of the sand. The New Jersey longshoremen also claim that the "winkle" (*Fulgur carica*) has the power of pulling the "razor" from its burrow and devouring it.

Venus mercenaria, Linné.

This is the "quahaug," or "round clam," sometimes known as the "hard clam." It is found from Florida to Massachusetts Bay, and thence northward, though rare and local, to the Gulf of Saint Lawrence. It is very common from Vineyard Sound southward, and is found fossil in the Post-Pliocene formations of Massachusetts, Gardiner's and Nantucket Islands, Virginia and South Carolina, and in the Miocene of Maryland, Virginia, and North and South Carolina. This species lives chiefly on muddy and sandy flats, just below low-water mark; but it is often found above that line, and between tides is frequently left bare. It is more abundant in estuaries than elsewhere. It can burrow but a short distance, having short siphon-tubes, and it is often seen crawling about on the surface by means of the broad, muscular foot with which it excavates its burrow. The shells are variable in color and form, and early writers have made many varieties of this species on that account. Some forms, especially those growing in estuaries, have dull, thick, rough shells, sometimes white, sometimes stained, while shells from outer, sandy beaches are thinner and more delicate, have raised, concentric ridges or ribs, and are marked with streaks of brown or red. Other shells have marked dark blue or purple discolorations outside the pallial line; others are of dead white. All these have been described as distinct species, but there is no structural difference; and intermediate forms are to be found in every locality. As these clams grow old, the valves

become rounded, and are then known to the fishermen as "snub-nosed" or "bull-nosed" clams, and are sometimes a pound or more in weight. Their flesh is then a dirty yellow, having lost its clean, white appearance. Little is known, except by analogy, of the embryology of the "quahaug" or of its rate of growth. Ingersoll states that the medium sized sent to market are five years old, while Messrs. Foote & Co., of New Haven, state that the medium-sized clams are but two years old. Their rate of growth no doubt depends upon the locality; where there is an abundant supply of food and lime, and the animal is protected, the growth will be rapid; when otherwise, the growth will be slow. The rate of growth is also said to influence the shape of the shell, the slower the progress the greater being the convexity of the valves. During the winter the "quahaugs" retire into the mud, disappearing from the surface, and in the spring reappear in time for the principal fishery, which begins then and extends throughout the summer, thus alternating with the oyster season.

The "quahaug" fishery is very extensive, this bivalve being, next to the oyster, the most important on the coast; but the implements and methods are simple in the extreme. Many clams are gathered by hand as they crawl on the flats; many more are taken with straight rakes, curved drag-rakes, and dredges. Oyster-tongs are also occasionally used, but not frequently, as the clams do not live in sufficiently close communities to make tonging profitable. The rakes are more generally employed than any other implement, and in form and character they vary with the locality. Some are merely slight modifications of the garden rake; others are more elaborate, having curved teeth or long poles, fitting them for dragging or dredging rather than shallow-water raking. Specimens of the different varieties are exhibited, but, like the other clam fisheries, that of the "quahaug" utilizes many implements designed originally for other purposes, such as the sea-moss rakes, spades, shovels, &c.

"Count" clams, the largest size, bring the best prices, and in the neighborhood of New York sell for $3 per barrel, wholesale. It takes 800 "counts" to make a barrel; and as 3 to 4 barrels, or 2,400 to 3,200 clams, is a good day's catch, some idea of the productiveness of the New Jersey flats and coast is gained from the foregoing. Smaller sizes are sold at 60 cents or $1 per bushel, depending on the size, and some are taken so small that 2,000 are required to fill a barrel; these, when about one inch in diameter, are called "tea-clams." Another name is "Little Neck," derived originally from a neck of land on the north shore of Long Island, known as Little Neck, whose clams had a superior flavor; but the demand for a young, small, and tender clam which has sprung up of late years, and was supplied from the Little Neck stock, has caused dealers generally to apply the term "Little Neck" to all small clams. They are used principally for pickling.

The fishery is not an expensive one, the whole outfit of the "clammer"

not requiring an expenditure of over $150, including boat, rake, and baskets, and the pursuit is naturally followed by the poorer class of people—men who are employed by the oyster-dealers in winter and are out of work during the summer. The principal depots are New York and Philadelphia, but a large number of clams are consumed throughout the interior of the New England and Middle States, and every seaboard town sends its quota to supply the demand. To the southward of the Delaware and Chesapeake this consumption diminishes very fast, that of all the Southern States being estimated by Ingersoll at not more than 50,000 bushels, valued at $20,000.

The summary of the annual product and value of the "Quahaug" fish-fishery for the whole coast is:

Number of clams taken, 326,245,800.

Number of bushels, 1,087,486.

Value, $657,747.

Mytilus edulis, Linné.

This is the ordinary "black" or "edible" mussel. It is found from the Arctic Ocean south to North Carolina, on the east coast, and south to Monterey on the west coast of the United States. It is very abundant from New Jersey northward and is found fossil in the Post-Pliocene formations of most of the localities north of Rhode Island. It is identical with the common mussel of Europe in all respects.

The *Mytilus edulis* is most abundant in the shallow and brackish waters of bays and estuaries, but flourishes well in any situation where there is a little mud and some solid object to which it can attach itself. The coasts of New Jersey and Long Island are especially adapted to it, and it is found in those regions in immense numbers. It has also increased of late years in Chesapeake Bay and tributaries. It grows very rapidly, reaching maturity, under favorable circumstances, in one season. It is not confined to shallow waters, but exists in the deep as well, having been taken off the coast of Maine in 40 and 50 fathoms. The shells of those living in sheltered localities and on sandy bottoms are, however, much more delicate in texture and brilliant in color than those inhabiting exposed situations. The former are often beautifully marked with alternating bands of different colors or are pale yellow or translucent horn color. The latter are thicker, of a dull brown or bluish-black color, and often much distorted.

The breeding season begins early in the spring, and Verrill states that he has found immense numbers of the size of a pin's head as early as the middle of April. The mussel attaches itself to its support by means of a "byssus" or silk-like thread, spun from the foot, and as it has the power of relinquishing its hold on the ends of the threads at any time, it can change its location at will, and by means of the delicate byssus, can even climb the perpendicular sides of piles and rocks. On the muddy bottoms of bays and sounds these mussels frequently exist in large

patches or beds, and such local ities are the favorite resorts of the predatory fishes, mollusks, crustaceans, and radiates. The star-fishes especially frequent these areas and destroy immense numbers of mussels. All the injurious Gasteropods prey upon them more or less, wherever found, and the tautog, drum, and other fishes devour the adults, while the scup and like smaller fish feed upon the young.

Though used as food to a limited extent on both coasts of the United States, there is no organized fishery devoted to the capture of the mussel. In common with many other shell-fish not known in the markets, they are eaten occasionally by the inhabitants of the coast, and of late years some trade is springing up on the coasts of Connecticut and Long Island. Most of the mussels sold for food go to New York and are there disposed of in the natural state, but more frequently are boiled and pickled. Inhabiting the interior of the shell of the mussel is a small messmate—the *Pinnotheres maculatus*, or mussel-crab—which, like the little oyster-crab, is a delicious morsel. While not as yet extensively utilized as food, the mussels, like many other shell-fish, are frequently used for fertilizing the ground, the farmers of Long Island and New Jersey securing them by the wagon-load for that purpose. In time, however, they will probably occupy as prominent a place in the food supply of the American seaboard as they do on the coasts of Europe. The value of the mussel fishery in 1879–'80 is estimated by Ingersoll at $37,000, which represents a yield of 600,000 bushels.

Modiola plicatula, Lamarck.

This species, known as the Ribbed-mussel, is found from Georgia to Casco Bay, Maine, and exists, though more rare and local, further north. It is very abundant from Vineyard Sound to the southward, especially along the coast of New Jersey, and has been reported of late as increasing in Chesapeake Bay. It is more abundant in the neighborhood of estuaries and salt marshes, or on muddy shores, and is usually found about high-water mark, where it is left uncovered for a greater part of the time by the tide. Along the edges of marshes they are sometimes crowded so thickly as to form a stratum 6 inches or more in thickness. Like the *Modiola modiolus*, this species is not of commercial importance. It is very seldom eaten by man, though it is devoured by many fishes, especially the "drums," and by star-fish and the carnivorous Gasteropods. In company with an allied species, the *Modiola hamatus*, and the *Mytilus edulis*, it is used quite extensively on the New Jersey coast for fertilizing ground. The presence, which is by no means infrequent, of this mussel on an oyster-bed, is undesirable, the bunches and masses held together by the byssus, attracting the various enemies, that, though they came for the mussels, remain to devour the more valuable oysters.

Modiola modiolus, Turton.

This, the great "horse-mussel," is found from Greenland southward to New Jersey on the Atlantic, and from the Arctic south to Monterey on the Pacific coast. It is more abundant north of Cape Cod than to the southward, and is found from low-water mark to 80 fathoms. It is fossil in the Post-Pliocene formations of Massachusetts and Canada. The horse-mussel is usually located in crevices between rocks, or bedded in the gravel; and along the coasts is almost entirely confined to rocky bottoms. Its large size and brown, hairy epidermis, sufficiently distinguish it from other species. Though occasionally used for bait, and available for food, it is at present of no commercial importance.

Pecten irradians, Lamarck.

This is the common "scallop" of the eastern coast. It extends from Texas and the Gulf of Mexico to Cape Cod, and is occasionally found north of that point. It is fossil in the Post-Pliocene of North Carolina and Florida, in the Pliocene of South Carolina, and in the Miocene of Maryland.

The "scallop" is found on sandy and shelly bottoms, in sheltered localites, but usually prefers those points where the eel-grass abounds and where there is more or less mud on the bottom. During the summer the young shells may be seen clinging to the eel-grass or sea-weed in large numbers, and in the autumn the mature animals are found in the shallow waters along the shores in great abundance. Also after storms great quantities are thrown upon the beaches. But the scallop is nomadic; no one locality can be sure of its crop, no matter how abundant the animals may have been during the previous seasons. Indeed, some of the harbors of Long Island are visited by scallops in numbers but once in four and five years, and at other points the appearance and disappearance is irregular. Unlike many other bivalve mollusks, the *Pecten irradians* is not fixed immovably to some foreign object; is not anchored by a network of threads or "byssus," nor is it compelled to creep slowly along the surface of the mud or sand by means of a "foot" however muscular and strong. On the contrary, it is a very active swimmer, and by opening and energetically closing its valves, it forces the water from the gill-cavity, the reaction driving the animal backward through the water. It is very watchful, quickly perceiving an enemy, and when alarmed, deserts the matted leaves of eel-grass, its usual habitation, and takes to the bottom. In moving from place to place, the animals make a succession of leaps to the surface, each time advancing some yards on their journey, and great schools of those curious shells are sometimes seen thus darting about in the water. The spawning takes place during the summer, and continues as late as September. The size of the shells at that time is shown in the series illustrating the rate of growth. The growth during the autumn months is quite rapid, but it is claimed that

further advancement is stopped as soon as the winter sets in. About the middle of July or first of August following, when the scallops are one year old, the growth begins again, and is very great during the succeeding autumn months. At this age they are marketable. The increase in size after the first year is not very great, and scallops two and three years old are not only difficult to find, but are worthless for market purposes. It is the general impression among the fishermen that the animals see but one spawning season, and die during the succeeding winter. No doubt the excessive fishery has had its influence in producing this opinion, and probably the scarcity of scallops two and three years old, is due, to some extent, to the persistent search for those of a marketable age, or those fifteen and eighteen months old.

The method of conducting the fishery varies somewhat with the locality, but is essentially as follows: The fishing boats, especially in Narragansett and Peconic Bays, which are the principal centers of the industry, are usually cat-boats, small sloops, or sharpies, and are provided with six, eight, ten, and twelve dredges or scrapes of the patterns exhibited. These are put over from the sides and stern of the boat, and towed after her as she sails backward and forward over the dredging-ground. As soon as a dredge is full it is hauled in and emptied on the "culling" board, which extends across the boat, and then put over again. The scallops are then separated from the other matter brought up by the dredge. In calm weather smaller boats or dories are employed, one man pulling and another tending the dredges, and occasionally, in shoal and clear water, a dip-net with a long handle is used. The best grounds for dredging are those where there is only a thin layer of mud over the sand. The only part of the scallop that is used is the great white abductor muscle, known to the fishermen as the "eye" or "heart." This is extracted from the shell, the process being termed "cutting out", by a dextrous motion, or rather combination of three motions of the short knife of the opener. It is wonderful to witness the extraordinary rapidity with which the "cutting out" is done; but though the process appears less fatiguing than oyster-opening, it is not so rapid, the latter process requiring but two motions instead of three. In the early part of the season a bushel of scallops will yield one-half gallon of meats, but in December the animals have increased so much in size, that a full gallon is produced from the same quantity. The "meats" are packed in wooden boxes or tubs, and transported, if possible, without ice, as contact with that article impairs the flavor. The trade is confined principally to to the New England States and New York markets. The meat has a fresh, sweetish, and somewhat insipid flavor, not usually appreciated by the uneducated palate. It is seldom eaten raw, but is usually cooked, being fried or boiled; some also are pickled. In addition to its commercial importance, the *Pecten irradians* furnishes food to many important edible fishes, such as the cod and others; it is also preyed upon by all the carnivorous Gasteropods, and by the star-fish and crabs.

The principal fishing localities on the east coast of the United States are Buzzard's Bay, Massachusetts, Greenwich, Rhode Island, Peconic Bay, Long Island, and Morehead City, North Carolina. On the west coast, Wilmington and San Diego; but there is no regular trade in scallops in those localities.

In 1880 the product and value of the industry was:

Number of gallons, 72,063.

Value, $28,825.20.

Pecten tenuicostatus, Mighels.

This is the "Great" or "Giant" scallop, and is found from New Jersey to Labrador, but is rare and local south of Cape Cod. It is generally found in comparatively deep water, existing in the Bay of Fundy in over 100 fathoms, but may be taken in as little as 2 and 3 fathoms. This species is not abundant nor of commercial importance. It is available for food, however, and is occasionally used as such. It is distinguished from the common scallop by its size, smooth surface, and peculiar, reddish-brown epidermis.

Argina pexata, Gray.

This is the *Arca pexata* of Say and the "Bloody Clam" of the fishermen. It is found from Florida and northern shores of the Gulf of Mexico to Cape Cod, and is local but rare, north of that point. The proper home of this animal is in off-shore shallow bottoms. It is sometimes found in other places, attached by a byssus, but not generally. It is occasionally used for bait, but otherwise is not of importance. The term "bloody," applied to them, and the *Scarpharca transversa*, a similar shell, is due to their discharge of a sanguineous liquor when opened. They are thus, and by their rough, dark, hairy epidermis, readily distinguished.

The various species of star-fishes are supposed to prefer the "bloody" clams to all other food, and the presence of the *Argina pexata* on or about an oyster-bed is therefore a welcome sight to the planter.

Glycimeris generosa, Gould.

This is a Pacific coast species, known as the "Geoduck" or "Giant Clam", having an extensive range, but not existing in very large numbers. It is found in sheltered localities on the coast, from Puget Sound to San Diego; it lives in rather deep water, rarely being found except below extreme low-water mark. Its long siphons permit great depth of the burrows, which usually penetrate the sandy-mud bottoms in which the animal lives, some two or three feet. The northern animals are the largest and most abundant.

The Geoduck is said to be of very fine flavor, but too rich to be used constantly as food. One animal is sufficient for an entire meal. Owing to its scarcity, it is not at present eaten extensively.

Siliqua patula, Dixon.

This species, the "Flat Razor Clam", is found from Alaska to California, and is especially abundant along the northern coast. It grows to a length of four or five inches, and is covered with a glossy, rich brown epidermis. It does not burrow very deep, and is esteemed delicious food, but is not extensively used.

Platyodon cancellatus, Conrad.

This is the "Date Fish", a species closely resembling *Mya arenaria*, found along the coast of California from San Francisco southward. It exists in great abundance in Baulinas Bay and at Santa Barbara. Its habits are essentially those of the "soft clam", and it forms one of the staple food shell-fish of the Pacific coast.

Zirphæa crispata, Mörch.

This mollusk, though widely distributed along the Atlantic coast of the United States, is not of commercial importance, while on the Pacific coast, where it is known as the "Date Fish," it is found in the markets and eaten by numbers of people. The Pacific variety is, however, considerably larger than that ordinarily found on the eastern coast. It is a northern species, not occurring south of Eastern Connecticut, and extending to the Gulf of St. Lawrence, in the Atlantic, and on the west coast being rarely found south of San Francisco. It is fossil in the Post-Pliocene of Maine. All the *Pholadidæ* are borers, and *Z. crispata* is no exception, but it is not very destructive, usually preferring mud and clay to wood.

Macoma nasuta, Conrad.

This species, called the "Tellen", is very common on the Pacific coast, and has a wide range, extending from Kamschatka to Mexico, but is rare south of San Diego. It is abundant in San Francisco Bay, and it was evidently eaten largely by the aborigines, as the shell-mounds in the vicinity of the bay are largely composed of shells of this species. It inhabits muddy flats, burrowing quite deeply, and reaches the water by its two small, red siphons. The usual length is two inches. It is eaten on the Pacific coast by all classes.

Tapes staminea, Conrad.

This species, known as the "Carpet-Shell", "Little-Neck Clam," and "Hard-Shelled Clam", is abundant on the whole Californian coast, and is found in all the markets. Tomales Bay furnishes a large number, as do other points where the animal is to some extent protected, as at Baulinas. It is usually found between tide-marks, buried one or two feet in the bottom, which may be either muddy or stony. This and other species designated as "Little-Neck Clams" occupy a similar place

in San Francisco markets to that of the small-sized *Venus mercenaria*, used so extensively in the Eastern States.

Tapes laciniata, Cpr., is a closely allied species, and has about the same distribution as *T. staminea*. No distinction is made in the markets between them, both being sold as "Little-Neck" or "Hard-Shell" clams. They are the most abundant and extensively used of all the clams indigenous to the coast; but of late, since the introduction of the *Mya arenaria*, they have been supplanted in the markets to a great extent extent by that animal.

Chione succincta, Val., and *Chione simillima*, Sby., are also known in the markets as "Little-Neck" clams, but are not so abundant as *Tapes*. They live on sandy beaches on the California coast, and especially in Monterey Bay and other sheltered localities, but are not found in sufficient numbers to be of much importance as a food supply.

Saxidomus aratus, Gould.

This is the "Round Clam" of the Pacific coast. It is found from San Francisco to the southward to San Diego, but is not abundant. Monterey and San Diego produce it in largest numbers. It is probably only a southern variety of the northern shells of this genus.

Teredo.

There are four species of the genus *Teredo* found on the coast of the United States, and also an allied species, the *Xylotrya fimbriata*, of Jeffreys, having similar habits. The *Teredo navalis*, Linné, is the most abundant, and extends from Vineyard Sound to Florida. The *Teredo megotara*, Hanley, is found from Massachusetts Bay to South Carolina. The *Teredo Thomsonii*, Tryon, is indigenous, but its distribution has not yet been thoroughly determined; the *Teredo dilatata*, Stimpson, occurs from Massachusetts to Florida, and the *X. fimbriata* has the same range. These creatures are usually known as ship-worms and inhabit submerged wood-work, floating or stationary, and frequently do great damage. An instance is recorded of the piles of a wharf at Cape Henry having been destroyed in nine days by their ravages. Though they burrow into all submerged wood-work, it is for protection and not for food, and the excavations once made are neatly lined by the animal with shelly material. While at the surface the holes are very small, having been made by the young *Teredos;* as they go deeper, they gradually grow larger, and are sometimes 10 inches in length and one-quarter inch in diameter. The tubes, however they may enter the wood, usually turn, at a short distance from the surface, in a direction parallel with the grain. The burrow of one animal never interferes with, or crosses that of another, and a thin partition of wood is always left between the tubes. The tendency to follow the grain is not due to necessity, for the *Teredo* can bore through the hardest knots; nor is it necessary that the tubes should be straight, for they are often very crooked and tortuous.

The animals grow very rapidly, attaining maturity in one season. The young are produced in May and in the summer months, and during the early stages of development are free-swimming. While embryonic, they have organs both of sight and hearing, and are also provided with a "foot"; but as they develop, their powers of sight and swimming are lost. When they finally locate themselves they are about the size of the head of a pin, but this size rapidly increases. The destructive powers of the "ship-worm" are well known, and probably there is no effective remedy except that in use for protecting the bottom of vessels, viz., copper sheathing. The various poisonous substances applied to timber are of no use, as the animal does not live on the wood, but uses it as a location only. The only remedies likely to succeed are those which will prevent an entrance. The United States Engineer Corps has experimented, at the Delaware Breakwater, for some years, with wood that had been treated with creosote, and the experiments appear to have been successful; but whether the success is accidental or not has not yet been determined.

Martesia cuneiformis, Gray.

This is another species of the genus *Pholas*, and is known as the "Boring Pholad," of the oyster-beds. It is very common and abundant in Chesapeake Bay, and is found in any waters to which Chesapeake oysters have been transported. It lives in small chambers, which it excavates in the shells of oysters or other bivalves, but rarely does any serious damage, the efforts of both oyster and pholad being directed to the prevention of complete penetration of the valve. The pholad appears to flourish best in brackish water, and in Chesapeake Bay was most abundant on oyster-beds that had evidently deteriorated. Their presence, therefore, in large numbers is considered to be one of the indications of deterioration.

CATALOGUE.

MOLLUSCA CEPHALOPODA.

SQUIDS AND CUTTLES.

Ommastrephes illecebrosa, Verrill. Squid, Flying Calamary, Sea-arrow. Northeast coast of North America.

33655. New England coast. United States Fish Commission.
33660. Eastport, Maine. United States Fish Commission.

Loligo pealii, Lesueur. Common Squid. South Carolina to Massachusetts Bay.

33656. New England coast. United States Fish Commission.

Loligo brevis, Blainville. Calamary or Ink-fish. Southern and southeastern coasts of the United States.

33661. Coast of Louisiana. United States Fish Commission.

Architeuthis princeps, Verrill. Giant Squid. Coast of Newfoundland and adjacent waters. Model made by Mr. J. H. Emerton, from measurements and descriptions of a Squid thrown ashore at Catalina, Trinity Bay, Newfoundland, September 24, 1877. Principal dimensions: Length of body, 8 feet; Length of head, 1½ feet; length of tentacles, 30 feet; length of 1st pair of arms, 8½ feet; length of 2d pair of arms, 9½ feet; length of 3d and 4th pair of arms, 11 feet; greatest diameter of body, 2½ feet.

Octopus punctatus, Gabb. Octopus, or Devil Fish. Northwest coast of the United States. Model made by Messrs. J. H. Emerton and Wm. Palmer, from inspection of small specimens, and published measurements and descriptions. Length of longest arms, 16 feet; length of shortest arms, 13 feet; diameter of circle swept by arms, 18 feet.

MOLLUSCA GASTEROPODA.

SEA SNAILS.

Useful for food or bait.

Buccinum undatum, Linné. Whelk. Long Island Sound to Greenland. Not common south of Cape Cod, except in deep water. Very abundant on coast of Maine.

33637. Vineyard Sound. United States Fish Commission.

Fulgur carica, Conrad. Periwinkle, Winkle, and Wrinkle; also Ribbon Whelk.

(See "Injurious Gasteropods.")

Sycotypus canaliculatus, Gill. Periwinkle, Winkle, and Wrinkle; also Hairy Whelk.

(See "Injurious Gasteropods.")

Littorina littorea (Linné), Menké. Pennywinkle, or Sea Snail. Northeastern coast, from Connecticut to Nova Scotia.

33654. Wood's Holl, Mass. United States Fish Commission.

Purpura lapillus, Lamarck. Sea Snail.

(See "Injurious Gasteropods.")

Ilyanassa obsoleta, Stimpson. Sea Snail. Whole southern and eastern coast of the United States, but rare and local north of Cape Cod.

33633. Vineyard Sound. United States Fish Commission.

Lunatia heros, Adams.

(See "Injurious Gasteropods.")

Neverita duplicata, Stimpson.

(See "Injurious Gasteropods.")

Haliotis (several species). See below.

Useful by producing Pearl shell.

Trochiscus norrissii, Sowerby. Turban Shell.

32830. Coast of California. H. Hemphill.

Pomaulax undosum, Chemnitz.

32832. Coast of California. Natural state. H. Hemphill.

32831. Coast of California. Prepared to show pearly layers. H. Hemphill.

Haliotis (various species). Abalones or Sea-Ears. Pacific coast of the United States from San Francisco southward. Coast of Lower California and Mexico. Not common south of Magdalena Bay, Lower California.

Haliotis kamchatkana.

32838. Coast of Alaska. J. G. Swan.

Haliotis corrugata, Gray. Rough Sea-Ear.

32890. Coast of Southern California. W. H. Dall.

Haliotis rufescens, Sowerby. Abalone or Red Sea-Ear.

32900. Monterey, California. H. Hemphill.

Haliotis cracherodii, Leach. White Abalone.

32823. Coast of California. Paul Schumacher.

32899. Monterey, California. H. Hemphill.

Haliotis splendens, Roe. Splendid Sea-Ear.

32821. Coast of California. Paul Schumacher.
32898. Coast of Southern California. H. Hemphill.

Manufactured state of Haliotis shell.

29302. Furnished by A. B. de Frece & Co., 428 Broadway, New York.
29248. Furnished by Harvey & Ford, Philadelphia, Pa.

Manufactured state of various American Pearl shells derived from Gasteropods.

29301. Variety furnished by A. B. de Frece & Co., 428 Broadway, New York.

Affording dye, as well as ornamental.

Phyllonotus brassica, Lamarck. Purple-shell.

32911. Coast of Lower California. W. H. Dall.

Phyllonotus bicolor, Valenciennes. Purple-shell.

32912. West coast of America. W. H. Dall.

Affording cameo and porcelain stock.

6968. Cameo-shell (*Cassis rufa*), used for cameo cutting. Florida. Dr. Wm. Stimpson.

Injurious, by destroying food-producing mollusks.

Fulgur carica, Conrad. Periwinkle, Winkle, and Ribbon-Whelk. Eastern coast of the United States from Florida to Cape Cod; abundant in Vineyard and Long Island Sounds.

33635. Vineyard Sound. United States Fish Commission.
33458. Oyster Bay, Long Island. H. A. Townsend.
33453. East Greenwich, R I. A. A. Wilson.
33613. Egg capsules. East Greenwich, R. I. A. A. Wilson.

Sycotypus canaliculatus, Gill. Periwinkle, Winkle, Wrinkle, and Hairy Whelk. Whole eastern and southern coasts of the United States as far as Cape Cod; abundant in Vineyard and Long Island Sounds.

33401. Oyster Bay, Long Island. H. A. Townsend.
33454. East Greenwich, R I. A. A. Wilson.
33611. Great South Bay. Blue Point, Long Island. F. C. Dayton.
33636. Vineyard Sound. United States Fish Commission.
33612. Egg capsules. Great South Bay. F. C. Dayton.

Urosalpinx cinerea, Stimpson. Drill or Rough Whelk. Eastern coast of the United States to Massachusetts Bay; local farther north to the Gulf of Saint Lawrence; west coast of Florida; abundant from Virginia to Cape Cod, especially on oyster-beds.

33632. Vineyard Sound. United States Fish Commission.

Purpura lapillus, Lamarck. Drill or Whelk. Long Island Sound to Arctic Ocean; rare and local south of Cape Cod; abundant on northern coasts of New England and Nova Scotia.

33652. Wood's Holl, Mass. United States Fish Commission.

Lunatia heros, Adams. Sea Snail. Georgia to Gulf of Saint Lawrence and Labrador; abundant and large on coasts of New Jersey and Long Island.

33653. Vineyard Sound. United States Fish Commission.

Neverita duplicata, Stimpson. Sea Snail. Massachusetts Bay to Northern Florida; Northwestern Florida to Yucatan; local and uncommon north of Cape Cod; abundant fromNantucket southward.

33455. East Greenwich, R. I. A. A. Wilson.
33610. Great South Bay, Blue Point, Long Island. F. C. Dayton.
33657. Vineyard Sound. United States Fish Commission.

Crepidula plana, Say. Sea Snail or Slipper Shell. Massachusetts Bay to Florida; northern shores of Gulf of Mexico; local northward of Massachusetts to Gulf of Saint Lawrence; common in Vineyard and Long Island Sounds.

33658. Vineyard Sound. United States Fish Commission.

Crepidula fornicata, Lamarck. Sea Snail or Boat Shell. Casco Bay, Maine, to Florida; northern shores of Gulf of Mexico; local north of Massachusetts; abundant from Vineyard Sound southward.

33659. Vineyard Sound. United States Fish Commission.

While the above species of *Crepidula* are neither directly injurious nor beneficial, they are often associated with destructive Gasteropods. In addition, their absence from an oyster-bed is one of the many indications of its deterioration.

MOLLUSCA LAMELLIBRANCHIATA.

BIVALVE SHELL-FISH.

Affording food or bait.

Ostrea virginica, Gmelin. American Oyster.

— Map showing general distribution along the eastern coast of North America.

— Map showing location of oyster-beds along the coast of Prince Edward's Island, Nova Scotia, New Brunswick, and shores of the Gulf of Maine and Massachusetts Bay.

— Series of maps showing the distribution of oysters, and approximate areas and positions of natural and artificial oyster-beds, along the coast of the United States, from Cape Cod to the Rio Grande.

On these maps, red indicates natural oyster-ground; blue, artificial or "planted" beds; purple, interspersed natural and artificial beds; and pink, "scattered" oysters. The strength of the tinting indicates, roughly, the quality, and the variations in color the character, of the several areas.

Catalogue of maps of oyster beds.

Locality.	Scale.	Compiler.
Cape Cod Bay (extinct beds)	1-80,000	Mr. Edward P. Cook.
South coast, Massachusetts, "Nantucket Shoals to Muskeget Channel."	1-80,000	Mr. Vinal N. Edwards.
South coast, Massachusetts, Buzzard's Bay, "Muskeget Channel to Buzzard's Bay."	1-80,000	Do.
Narragansett Bay, "Cuttyhunk to Block Island"	1-80,000	Shell-Fish Commission of Rhode Island and Lieut. Francis Winslow, U. S. N.
Long Island Sound, "Point Judith to Plum Island"	1-80,000	Shell-Fish Commission of Connecticut and Lieut. Francis Winslow, U. S. N.
Long Island Sound, "Plum Island to Welch's Point."	1-80,000	Shell-Fish Commission of Connecticut and Lieut. Francis Winslow, U. S. N.
Long Island Sound, "Welch's Point to New York"	1-80,000	Shell-Fish Commission of Connecticut and Lieut. Francis Winslow, U. S. N.
South coast of Long Island, "Block Island and Montauk Point."	1-80,000	Lieut. Francis Winslow, U. S. N.
South coast of Long Island, "Great South Bay and Fire Island."	1-80,000	Do.
"New York Bay and Harbor"	1-80,000	Do.
Coast of New Jersey, "Sandy Hook to Barnegat Inlet."	1-80,000	Do.
Coast of New Jersey, "Barnegat Inlet to Absecom Inlet."	1-80,000	Midshipman J. B. Blish, U. S. N.
Coast of New Jersey, "Absecom Inlet to Cape May."	1-80,000	Do.
Delaware Bay, "Delaware Entrance"	1-80,000	Do.
Delaware Bay and River	1-80,000	Do.
Sea-coast of Maryland, "Cape May to Isle of Wight"	1-80,000	Lieut. Francis Winslow, U. S. N.
Sea-coast of Maryland, "Isle of Wight to Chincoteague Inlet."	1-80,000	Do.
Sea-coast of Virginia, "Chincoteague Inlet to Hog Island."	1-80,000	Do.
Sea-coast of Virginia, "Hog Island to Cape Henry"	1-80,000	Do.
"Entrance to Chesapeake Bay, Hampton Roads, &c."	1-80,000	Do.
Chesapeake Bay, "York River to Pocomoke Sound"	1-80,000	Do.
Chesapeake Bay, "Pocomoke Sound and Entrance to Potomac River."	1-80,000	Do.
Chesapeake Bay, "Potomac River to Choptank River."	1-80,000	Do.
Chesapeake Bay, "Choptank River to Magothy River."	1-80,000	Do.
Chesapeake Bay "Magothy River to Head of Bay"	1-80,000	Do.
Potomac River, "Entrance to Piney Point"	1-60,000	Do.
Potomac River, "Piney Point to Lower Cedar Point."	1-60,000	Do.
Rappahannock River, "Entrance to Deep Creek"	1-60,000	Do.
Rappahannock River, "Deep Creek to Occupacia Creek."	1-60,000	Do.
York River, "Entrance to King's Creek"	1-60,000	Do.
York River, "King's Creek to West Point"	1-60,000	Do.
James River, "Newport News to Point of Shoals Strait."	1-40,000	Do.
James River, "Point of Shoals Strait to Sloop Point."	1-40,000	Do.
South Carolina, "Winyah Bay"	1-40,000	Mr. G. S. Hobbs.
South Carolina, "Bull's Bay"	1-60,000	Do.
South Carolina, "Long Island to Hunting Island"	1-80,000	Do.
South Carolina and Georgia, "Hunting Island to Ossabaw Island."	1-80,000	Do.
Georgia, "Savannah to Sapelo Island"	1-80,000	Do.
Georgia, Sapelo Island to Amelia Island"	1-80,000	Do.
Georgia and Florida, "Cumberland Sound and St. John's River."	1-80,000	Do.
Florida, "St. Augustine Inlet to Halifax River"	1-80,000	Do.
Florida, "Halifax River to Mosquito Lagoon"	1-80,000	Do.
Florida, "Indian River"	1-80,000	Do.
Florida, "Tampa Bay"	1-80,000	Mr. Silas Stearns.
Florida, "Appalachicola Bay to Cape San Blas"	1-80,000	Do.
Coast of Alabama and Mississippi		Do.
Coast of Mississippi and Louisiana		Do.
Texas, "Galveston Bay to Oyster Bay"	1-80,000	Master C. McR. Winslow, U. S. N.
Texas, "Oyster Bay to Matagorda Bay"	1-80,000	Do.

Ostrea Virginica, Gmelin. American Oyster.

BIOLOGY.

SERIES OF ILLUSTRATIONS OF THE EMBRYOLOGY OF THE AMERICAN OYSTER, PREPARED FOR THE MARYLAND FISH COMMISSION BY DR. W. K. BROOKS, PH. D., OF JOHNS HOPKINS UNIVERSITY, BALTIMORE.

Explanation of the figures.

Unless the contrary is stated, the figures are drawn with a magnifying power of 250 diameters; Zeiss. F. 2, but it was necessary to amplify the sketches considerably in order to reproduce, by the process of photo-engraving, the features which this magnifying power rendered visible, and the figures as they are produced are of about twice the diameter of camera sketches made with the same magnifying power.

The first thirty-two figures show the process of segmentation. Figure 1 is an egg at the end of the first period of rest; Figures 2, 3, 4, 5, 6, and 7, the changes during the first period of activity; Figures 8, 9, 10, 11, 12, and 13, the changes during the second period of rest; Figures 14, 15, and 16. those which take place during the second period of activity; 17, 18, and 19, those which take place during the third period of rest; 20 and 21, during the third period of activity; 22, during the fourth period of activity; 23, during the fifth period of activity, and the remaining figures show more widely separated stages. In all the figures of segmentation, except 29, 30, and 31, the formative pole is above and the nutritive pole below.

Figure 1.—Eggs two hours and seven minutes after fertiiization. It is now perfectly spherical, with an external membrane, and the germinative vesicle is not visible.

Figure 2.—The same egg two minutes later. It is now elongated; one end is wider than the other, and a transparent area at the broad end marks the point where the polar globules are about to appear. At the opposite end the external membrane is wrinkled by waves which run from the nutritive towards the formative pole in rapid succession for about fifteen seconds.

Figure 3.—The same egg two minutes later.

Figure 4.—The same egg two minutes later. The yolk has become pear shaped. The polar globule has appeared at the formative pole, in the middle of the broad end of the pear, and the nutritive end of the egg is now less granular than the formative end.

Figure 5.—The same egg two minutes later. Three equidistant furrows have made their appearance, separating it into a single mass at the nutritive pole, and two at the formative pole. At this stage the three masses are about equal in size.

Figure 6.—The same egg two minutes later. The first micromere, *c*, is now perfectly separated, and smaller than the second, *b*, and each is smaller than the macromere, *a*.

Figure 7.—The same egg one minute later. Both micromeres are separated and are spherical, as is also the macromere. This stage ends the first period of activity.

Figure 8.—The same egg forty-five seconds later. The two micromeres have begun to fuse with each other, and the second micromere, *b*, is also partially fused with the macromere, *a*.

Figure 9.—The same egg one minute later. The first micromere, *c*, has also begun to unite with the macromere.

Ostrea Virginica, Gmelin. American Oyster—Continued.

Figure 10.—The same egg one minute later. The line between the second micromere and macromere has disappeared, and the first micromere, *c*, now projects from one end of the elongated mass formed by the union of the spherules *a* and *b*.

Figure 11.—The same egg three minutes later. The fusion of *a* and *b* is now complete, and a large transparent vesicle is now visible in the first micromere, *c*, and another in the compound mass, *ab*.

Figure 12.—The same egg two minutes and thirty seconds later.

Figure 13.—Another egg, about two minutes later. This is the true resting stage, at the end of the second period of rest. The two vesicles have become irregular. The remains of an external membrane adhere to one side of the egg.

Figure 14.—The same egg seven minutes later than Figure 13. The compound mass, *a* and *b*, is elongated, the first micromere, *c*, is well defined, and waves travel from the nutritive towards the formative ends of the two masses. Two segmentation nuclei occupy the positions of the large vesicles of earlier stages. This stage is the beginning of the second period of activity.

Figure 15.—The same egg one minute later. The second micromere, *b*, is now well defined, as well as the first.

Figure 16.—The same egg one minute later. This stage marks the end of the second period of activity. The formative end of the egg is now occupied by four micromeres, two of which seem to be the products of the division of the first micromere, *c*, and two of them the products of the second, *b*.

Figure 17.—The same egg two minutes later, at the commencement of the third period of rest. The second micromere, *b*, has again begun to fuse with the macromere, *a*.

Figure 18.—The same egg three minutes and thirty seconds later. The second micromere is no longer separated from the macromere, and mass, *a* and *b*, formed by their union is nearly spherical.

Figure 19.—The same egg two minutes and a half later, at the end of the third period of rest, viewed at right angles to Figure 18.

Figure 20.—The same egg thirteen minutes later, and in the same position as Figure 18. The spherule, *c*, of figure 19 has divided into two, and the second micromere, *b*, has become prominent, so that there are five micromeres at the formative pole.

Figure 21.—The same egg one minute later, and in the same position as figure 19.

Figure 22.—The same egg in the position of Figure 20, fifteen minutes later than Figure 21, and in the fourth period of activity. There are now seven micromeres at the formative pole, six on one side of the polar globules and one, the second micromere, *b*, on the other.

Figure 23.—The same egg twenty-one minutes later, viewed from the side opposite the second micromere. The cells which have been formed by the division of the micromeres of the stage 19 now form a layer, the ectoderm, which rests, like a cap, on the macromere, *a*.

Figure 24.—The same egg five hours and fifteen minutes later, in the same position as Figure 22, but not quite so much magnified. On one side the polar globule is still separated from the macromere, *a*, by a single spherule—the second micromere, *b*. Opposite this the growing edge, *g*, of the ectoderm is spreading still farther down over the macromere. At the point *g*, and at four other points, are pairs of small cells, which have evidently been formed by the division of the large spherules.

Figure 25.—Another egg at about the same stage.

Ostrea Virginica, Gmelin. American Oyster—Continued.

Figure 26.—The egg shown in Figure 24, fifty-five minutes later. The macromere, *a*, is almost covered by the ectoderm, and the second micromere, *b*, has divided into a number of spherules. At the growing edge, *g*, an ectoderm spherule is seen separating from the macromere.

Figure 27. —A similar view of an egg twenty-seven hours after impregnation. The macromere is almost covered by the ectoderm, *ec*, and is not visible in a side surface view. At *g* is an ectoderm spherule, which is separating from the macromere.

Figure 28.—Optical section of the same egg; *ec*, ectoderm; *en*, macromere, divided into two spherules. No segmentation cavity can be seen in a normal egg at this or any of the preceding stages.

Figure 29.—View of the nutritive pole of an egg a few hours older.

Figure 30.—View of the formative pole of a still older egg.

Figure 31.—Optical vertical section of a somewhat older egg, figured with the polar globule above and the ectoderm to the right. The egg is now flattened from above downwards, and is disk-shaped in a surface view. The macromere has given rise to a layer of larger granular cells, which are pushed in so as to form a large cup-shaped depression. The more transparent ectoderm, *ec*, now carries a few short cilia scattered irregularly, and the two layers are separated from each other by a segmentation cavity. This figure is in Plate III.

Figure 32.—Surface view, and

Figure 33.—Optical section of the embryo at the first swimming stage. The ectoderm has folded upon the endoderm, so as to form a primitive digestive cavity, with an external opening, *g*. The cilia of the velum have now made their appearance around the area occupied by the polar globule. This was not present in the egg from which the figure was drawn, but it was seen in other eggs, and is shown in a later stage of another embryo, Figure 6.

Figure 34 and Figure 35.—Two surface views of the embryo shown in Figure 32.

Figure 36.—An older embryo, in the same position as Figures 32 and 33. The external opening of the primitive digestive tract has closed up, and the two valves of the shell have appeared in the place which it had occupied. The endoderm has no connection with the exterior, and no central cavity could be seen.

Figure 37.—A somewhat older embryo, figured with its dorsal surface above. There is a large, central, ciliated digestive cavity which opens externally by the mouth *m*, which is almost directly opposite the primitive opening, the position of which is shown by the shell, *s*.

Figure 38.—A similar view of a still older embryo. The shell, *s*, has increased in size, and the digestive tract has two openings, the mouth, *m*, and the anus, *an*, which are very near each other on the ventral surface.

Figure 39.—The opposite side of a still older embryo, in which the body wall begins to fold under the shell, to form the mantle *m*.

Figure 40.—Dorsal view of an embryo at about the same stage.

Figure 41.—Dorsal view of an embryo at the stage shown in Figure 38, with its valves extended; *rs*, right valve of shell; *ls*, left valve of shell; *an*, anus; *a*, anal papilla; *ma*, mantle; *v*, velum; *b*, body cavity; *st*, stomach.

Figure 42.—View of left side of a still older embryo; *i*, intestine. Other letters as in Figure 41.

Figure 43.—Dorsal view of an embryo six days old, swimming by the cilia of its velum.

Figure 44.—View of right side of another embryo at the same stage; *mu*, muscles; *l*, liver. Other letters as in Figure 41.

Ostrea Virginica, Gmelin. American Oyster—Continued.

Figure 48.—The seminal fluid of a ripe male oyster, mixed with water, and seen with a power of 80 diameters. Zeiss. a. 2.

Figure 49.—Fluid from the ovary of a ripe female oyster, seen with the same magnifying power.

Figure 50.—Seminal fluid of a ripe male oyster, magnified 500 diameters.

Figure 51.—Egg a few minutes after mixture with the male fluid magnified 500 diameters.

Figure 52.—Egg about thirty minutes after fertilization magnified 500 diameters.

Figure 67.—Section of a portion of the visceral mass of a male oyster magnified 250 diameters. The surface epithelium of the body is shown at the lower end of the figure. Above this is a loose, thick layer of wrinkled cells, which have the appearance of adipose cells from which all the fat has been removed. Above this layer is a large duct, lined with epithelial cells, and filled with ripe spermatozoa, which have been poured into it from two follicles which communicate with it on each side. Above this are sections of a number of the follicles of the testis, in three of which the contents are figured.

Figure 53.—Section of a portion of the visceral mass of a female oyster magnified 250 diameters; *a*. epithelium of the surface of the body; *b*, layer of connective tissue; *c*, layer of wrinkled cells, which are probably fat cells, from which all the fat has been removed; *f*, sections of ten ovarian follicles; *e*, the ovarian eggs.

Figures 54–66.—Abnormal or direct form of segmentation.

SERIES OF PHOTOGRAPHS ILLUSTRATING ATTACHMENT AND GROWTH OF "SPAT" AND OYSTERS. INVESTIGATIONS OF FRANCIS WINSLOW, U. S. N., ASSISTANT U. S. COAST AND GEODETIC SURVEY, 1879.

SERIES OF SPECIMENS ILLUSTRATING ATTACHMENT OF SPAT.

33391. Jamaica Bay, L. I. C. E. Vreeland.
33519. Saunders' Point, Povidence River. Soft bttom. Jason S. Pierce.
32802. Bayou Cook, Louisiana. Alex. Gordon.
32796. Blue Point, Long Island. "Seed" on leather shoe. B. J. M. Carley.
33618. Oyster Bay, Long Island. Growth on stone. H. A. Townsend.
32973. Long Island Sound. Growth on part of stone jug. Hoyt Bros.
32792. Blue Point, Long Island. Growth on *Mactra* shell. B. J. M. Carley.
32958. Long Island Sound. Growth on various "stools." Hoyt Bros.
32958. Long Island Sound. Growth on "King crab." Hoyt Bros.
32958. Long Island Sound. Growth on stone. Hoyt Bros.
33390. Huntington Harbor, Long Island. Growth on stone. Wilson Beardsley.
32793. Blue Point, Long Island. Growth on stone. B. J. M. Carley.
32970. Long Island Sound. Growth on bottle. Hoyt Bros.
32971. Long Island Sound. Growth on stone. Hoyt Bros.
32894. Blue Point, Long Island. Growth on bone. B. J. M. Carley.
3151. Long Island Sound. Growth on stone. Hoyt Bros.
33619. Patchogue, Long Island. Growth on clay pipe. F. C. Dayton.
32932. Blue Point, Long Island. Growth on boot-leg. B. J. M. Carley.
33572. Potomac River oyster transplanted June, 1882, to Delaware Bay. Peculiar growth. Thos. J. Love.
33573. Delaware Bay. "Set" five months old. Thos. J. Love.
33620. Providence River. Growth on crab. Monsell & Dewing.
32794. Blue Point, Long Island. Growth on rubber boot. B. J. M. Carley.

Ostrea Virginica, Gmelin. American Oyster—Continued.

32974. Blue Point, Long Island. Growth on rubber shoe. B. J. M. Carley.
33621. Maurice Cove, Delaware Bay. Growth on twig. Thos. J. Love.
32789. Blue Point, Long Island. Rosette of oysters. B. J. M. Carley.
32895. Blue Point, Long Island. Growth on rubber shoe. B. J. M. Carley.
33102. Presby's Creek, Va. G. W. Harvey.
33622. Maurice Cove, Delaware Bay. Growth on bottle neck. Thos. J. Love.
33459. Delaware Bay. Cluster of young oysters. S. I. Middleton.
32969. Long Island Sound. Growth on crab. Hoyt Bros.
33648. Great South Bay, Long Island. "Set" two months old. Monsell & Dewing.

SERIES OF SPECIMENS ATTACHED TO SLATE COLLECTORS USED BY MR. J. A. RYDER, DURING HIS INVESTIGATIONS AT ST. JEROME'S CREEK, MD., 1880.

33623. Placed August 3, taken in September 16, 1880, 44 days.
33624. Placed July 31, taken in October 21, 1880, 82 days.
33625. Placed August 3, taken in October 21, 1880, 79 days.
33626. Placed August 3, taken in October 21, 1880, 79 days.
33627. Placed August 3, taken in October 21, 1880, 79 days.
33628. Placed September 10, taken in October 21, 1880, 41 days.

SERIES ILLUSTRATING CHARACTERISTICS OF SEVERAL SPECIES OF OYSTERS.

Ostrea edulis Linné. European oyster.

32811. North Sea.

Ostrea borealis, Lamarck. Canadian oyster.

32810. Buzzard's Bay, Mass. Dr. Wm. Stimpson.

Ostrea lurida, Cpr. California oyster.

32879. Crescent City, Cal. W. H. Dall.

Ostrea Virginica, Gmelin. American or Virginia oyster.

33096. Saint Gerome Creek, Md. G. W. Harvey.

SERIES ILLUSTRATING VARIATIONS FROM *O. borealis* to *O. virginica* and *vice versa*.

33098. Tangier Sound, Md. G. W. Harvey.
33381. Oyster Bay, Long Island. Eighteen months old. Planted one year on hard bottom. H. A. Townsend.
32808. Coast of Florida. Raccoon oysters. Lieut. Kossuth Niles, U. S. N.
32961. Long Island Sound. Two to three years old. Hoyt Bros.
33382. Huntington Harbor, Long Island. From hard bottom. Wilson Beardsley.
32960. Long Island Sound. One to two years old. Hoyt Bro's.
32805. Appalachicola Bay, Fla. Lieut. Kossuth Niles, U. S. N.
33387. Huntington Harbor, Long Island. From soft bottom. Wilson Beardsley.
32965. Long Island Sound. Three to four years old. Hoyt Bros.
33102. Presby's Creek, Va. G. W. Harvey.
33407. Oyster Bay, Long Island. From hard bottom. H. A. Townsend.
33379. Oyster Bay, Long Island. From muddy bottom. H. A. Townsend.

Ostrea Virginica, Gmelin. American or Virginia oyster—Continued.

SERIES SHOWING PECULIARITIES OF GROWTH DUE TO ATTACHMENT OF SPAT.

33103. York River, Virginia. G. W. Harvey.
33102. Presby's Creek, Virginia. G. W. Harvey.
33101. Nasawaddox Creek, Virginia. G. W. Harvey.
32974. Long Island Sound. Hoyt Bros.
32797. Blue Point, Long Island. B. J. M. Carley.
33492. Bridgeport, Conn. Point No Point "seed." Wheeler Hawley.
33386. Huntington Harbor, Long Island. From soft bottom. Wilson Beardsley.
33383. Huntington Harbor, Long Island. From hard bottom. Wilson Beardsley.
33588. Indian River, Florida. G. S. Hobbs.
33393. Shrewsbury River, New Jersey. E. G. Blackford.
33390. Huntington Harbor, Long Island. Wilson Beardsley.
33104. Cherrystone Creek, Virginia. G. W. Harvey.
33417. Seaville, New Jersey. J. W. Gandy.
33590. Vicinity of Savannah, Ga. G. S. Hobbs.
33095. Rappahannock River, Virginia. G. W. Harvey.
33565. Poquonock River, Connecticut. J. P. Bogart.
33406. Freeport, Long Island. E. G. Blackford.
33592. Vicinity of Charleston, S. C. G. S. Hobbs.
33569. Maurice River Cove, Delaware Bay. Thos. J. Love.
33100. Little River, Maryland. G. W. Harvey.
33380. Oyster Bay, Long Island. H. A. Townsend.
33396. Bridgeport, Conn. Guilford River "seed." Wheeler Hawley.
33418. East Greenwich, R. I. A. A. Wilson.
33098. Tangier Sound, Chesapeake Bay, Maryland. G. W. Harvey.
33380. Oyster Bay, Long Island. H. A. Townsend.
33598. Corpus Christi, Texas. C. McR. Winslow, U. S. N.
33377. Oyster Bay, Long Island. H. A. Townsend.

SERIES SHOWING PECULIARITIES OF GROWTH DUE TO ABNORMAL INFLUENCES OR CHANGES OF POSITION SUBSEQUENT TO TIME OF ATTACHMENT.

32791. Glenwood, Long Island. B. J. M. Carley.
32795. New York Bay. B. J. M. Carley.
33406. Freeport, Long Island. E. G. Blackford.
33381. Oyster Bay, Long Island. Planted one year on hard bottom. H. A. Townsend.
33382. Huntington Harbor, Long Island. From hard bottom. Wilson Beardsley.
32786. New York Bay. Growth in still water. B. J. M. Carley.
33392. Patchogue, Great South Bay, Long Island. E. G. Blackford.
33569. Maurice River Cove, Delaware Bay. Thos. J. Love.
33427. East Greenwich, R. I. A. A. Wilson.
33403. Bridgeport, Conn. "Planted oysters." Wheeler Hawley.
33394. Great Sound, sea-coast of New Jersey. J. W. Gandy.
33589. Vicinity of Savannah, Ga. G. S. Hobbs.
33393. Shrewsbury River, New Jersey. E. G. Blackford.
33412. Jamaica Bay, Long Island. E. G. Blackford.
33410. Rockaway Inlet, Long Island. E. G. Blackford.
32787. Blue Point, Long Island. From a tide-way. B. J. M. Carley.

Ostrea Virginica, Gmelin. American or Virginia oyster—Continued.

33102. Presby's Creek, Virginia. G. W. Harvey.
33386. Huntington Harbor, Long Island. Wilson Beardsley.
32808. Coast of Florida. Raccoon oyster. Lieut. Kossuth Niles, U. S. N
33599. Blue Point, Long Island. F. C. Dayton.
33651. Cobb's Island, sea-coast of Virginia. Nathan Cobb.
32813. Nova Scotia. From a tide-way. J. R. Willis.

SERIES ILLUSTRATING GROWTH ON SOFT BOTTOM.

33379. Oyster Bay, Long Island. H. A. Townsend.
32959. Long Island Sound. Hoyt Bros.
32920. City Island, Long Island Sound. B. J. M. Carley.
33095. Rappahannock River, Virginia. G. W. Harvey.
33599. Blue Point, Long Island. F. C. Dayton.

SERIES ILLUSTRATING EFFECT OF SOFT MUDDY BOTTOM UPON INTERIOR OF SHELL AND DEPOSIT OF NACRE.

32807. Coast of Florida. Lieut. Kossuth Niles, U. S. N.
33101. Nasawaddox Creek, Virginia. G. W. Harvey.
33102. Presby's Creek, Virginia. G. W. Harvey.
33100. Little River, Maryland. G. W. Harvey.
33590. Vicinity of Savannah, Ga. G. S. Hobbs.
32103. York River, Virginia. G. W. Harvey.
33392. Patchogue, Long Island (Blue Point). E. G. Blackford.
32806. Cat Point, Appalachicola Bay, Florida. Lieut. Kossuth Niles, U. S. N.
33651. Cobb's Island, sea-coast of Virginia. Nathan Cobb.

SERIES ILLUSTRATING VARIATIONS IN COLOR OF EXTERIOR OF SHELL.

33379. Oyster Bay, Long Island. H. A. Townsend.
33571. Potomac River natives, transplanted to Delaware Bay in June, 1882. Thos. J. Love.
33528. New Haven, Conn., natives transplanted to Narragansett Bay in spring of 1882. Jason S. Pierce.
33393. Shrewsbury River, New Jersey. E. G. Blackford.
33588. Indian River, Florida. G. S. Hobbs.
32919. Cow Bay, Long Island. B. J. M. Carley.
32784. Prince Edward's Island (var. *borealis*). Mr. Dawson.
32933. Chesapeake Bay. T. B. Ferguson.
32799. San Diego, Cal. (*Ostrea lurida*). H. Hemphill.
33407. Oyster Bay, Long Island. From hard bottom. H. A. Townsend.
32960. Long Island Sound. Hoyt Bros.
32814. Rhode Island. Col. Totten.
33408. Oyster Bay, Long Island. From hard bottom. H. A. Townsend.
33406. Freeport, Long Island. E. G. Blackford.
32782. New York Bay. B. J. M. Carley.
33380. Oyster Bay, Long Island. H. A. Townsend.
33640. Coast of California (*Ostrea lurida*). R. E. C. Stearns.

SERIES ILLUSTRATING GEOGRAPHICAL VARIETIES.

COASTS OF NEW BRUNSWICK, MAINE, MASSACHUSETTS, AND RHODE ISLAND.

32783. Miramichi River, New Brunswick. W. H. Dall.
32785. Shediak, New Brunswick. W. H. Dall.

Ostrea Virginica, Gmelin. American or Virginia oyster—Continued.

33092. Shediak, New Brunswick. G. F. Mathew.
33093. Buctouche, New Brunswick. G. F. Mathew.
32978. Sheepscot River, Maine. From extinct beds. R. Dixon.
33555. Sheepscot River, Maine. From extinct beds. Dr. C. A. White.
32810. Buzzard's Bay, Massachusetts (var. *borealis*). Dr. Wm. Stimpson.
33448. East Greenwich, R. I. A. A. Wilson.

Providence River, Rhode Island.

33518. Natives, transplanted in 1881 to soft bottoms. Jason S. Pierce.
33523. Natives, three years old, transplanted when two years old to soft bottoms. Jason S. Pierce.
33524. Natives; old. Jason S. Pierce.
33530. Natives from Jolly Banks bed, hard bottom. Jason S. Pierce.

COAST OF CONNECTICUT AND NORTH SHORE OF LONG ISLAND.

32790. Greenwich, Conn. B. J. M. Carley.
33528. New Haven, Conn., three years old, transplanted to Providence River in spring of 1882. Jason S. Pierce.

Bridgeport, Conn.

33492. Point No Point. "Seed." Wheeler Hawley.
33488. Housatonic River. "Seed." Wheeler Hawley.
33496. Point No Point. "Seed." Wheeler Hawley.
33396. Guilford River. "Seed." Wheeler Hawley.
33403. Cultivated oyster twelve to fifteen years old. Wheeler Hawley.
33391. Two years old; transplanted to Jamacia Bay, Long Island, when six months old. Cornelius Vreeland.

South Norwalk, Conn.

32957. One year old. Hoyt Bros.
32962. Three years after transplanting. Hoyt Bros.
32966. Five to twenty years old. Hoyt Bros.
32972. Hoyt Bros.

NORTH COAST OF LONG ISLAND.

Huntington Harbor.

33382. From hard bottom. Wilson Beardsley.
33386. From soft bottom. Wilson Beardsley.
33390. Natural growth. Wilson Beardsley.

Oyster Bay.

33377. Planted on hard bottom. H. A. Townsend.
33376. Planted on hard bottom. H. A. Townsend.
33381. Planted on hard bottom one year. Eighteen months old. H. A. Townsend.
33408. Natural growth on hard bottom. One year old. H. A. Townsend.
33407. Natural growth on hard bottom. H. A. Townsend.
33378. Planted on soft bottom. H. A. Townsend.
33379. Natural growth on soft bottom. H. A. Townsend.

Ostrea Virginica, Gmelin. American or Virginia oyster—Continued.

Cow Bay.

32781. B. J. M. Carley.
32812. "Cove." B. J. M. Carley.
32919. "Mill pond." B. J. M. Carley.
32779. Loyd's Harbor. B. J. M. Carley.
32791. Glenwood. B. J. M. Carley.

SOUTH COAST OF LONG ISLAND.

Great South Bay, Patchogue and Blue Point Districts.

32914. "Seed." B. J. M. Carley.
32777. B. J. M. Carley.
33392. E. G. Blackford.

Oakdale.

33411. E. G. Blackford.

Freeport.

33406. E. G. Blackford.

Jamaica Bay and Rockaway Inlet.

33410. "Rockaway." E. G. Blackford.
33412. "Jamaica Bay." E. G. Blackford.

VICINITY OF NEW YORK AND COAST OF NEW JERSEY.

New York Bay.

32782. B. J. M. Carley.
32780. B. J. M. Carley.

Shrewsbury River.

32778. B. J. M. Carley.
33393. E. G. Blackford.

Barnegat Inlet.

33558. Illustrating growth of spat and barnacles. Allan Neill.
33559. Very old. Allan Neill.

Seaville.

33417. J. W. Gandy.
33465. Natives, three years after transplanting. Peter Watkins.
33467. Natives, one, two, three, five and six years after transplanting. Peter Watkins.

Somers' Point.

33480. Natives, one, two, and three years old. H. H. Vansant.

Lake's Bay.

33499. Five years old. Alex. Fish.

Ocean View.

33471. One to three years old. J. C. Sharp.

Ostrea Virginica, Gmelin. American or Virginia oyster—Continued.

Cape May.

33452. Cape May seed. J. W. Gandy.

DELAWARE BAY.

Maurice River Cove.

32915. Three years old. B. J. M. Carley.
32568. "Extras," five years old. Thomas J. Love.
33569. Peculiar growth. Thomas J. Love.

Arnold's Point.

33577. After transplantation for six months to Maurice River Cove. Thomas J. Love.
33575. "Culls," after transplantation for six months to Maurice River Cove. Thomas J. Love.

CHESAPEAKE BAY AND SEACOASTS OF MARYLAND AND VIRGINIA.

Chesapeake Bay.

32933. State of Maryland.
32954. Herring Bay, Maryland. E. G. Blackford.
33100. Little River, Maryland. G. W. Harvey.
33096. Saint Gerome Creek, Maryland. G. W. Harvey.
33099. Point Lookout Creek, Maryland. G. W. Harvey.
33097. Deep Creek, Virginia. G. W. Harvey.
33095. Rappahannock River, Virginia. G. W. Harvey.
33102. Presby's Creek, Virginia. G. W. Harvey.
33104. Cherrystone Creek, Virginia. G. W. Harvey.
33101. Nasawaddox Creek, Virginia. G. W. Harvey.
33103. York River, Virginia. G. W. Harvey.
33506. Chesapeake oysters, four years old, transplanted in 1881 to Lake's Bay, New Jersey. Alex. Fish.
33481. Chesapeake oysters, transplanted for one and two years to Somers' Point, New Jersey. H. H. Vansandt.
33561. Chesapeake oysters, transplanted to Barnegat, New Jersey. Allan Neill.

Potomac River.

33516. Transplanted to hard bottom, Providence River, Rhode Island, in the spring of 1882; will not live through the winter. Jason S. Pierce.
33571. Transplanted in June, 1882, to Delaware Bay. Thomas J. Love.

Tangier and Pocomoke Sounds.

32976. Pocomoke Sound. E. G. Blackford.
32788. Tangier Sound. E. G. Blackford.
33098. Tangier Sound. G. W. Harvey.
33512. Transplanted to hard bottom, Providence River, Rhode Island, in the spring of 1882. Will not live through the winter. Jason S. Pierce.

Ostrea Virginica, Gmelin. American or Virginia oyster—Continued.

Sea Coast.

33505. Hog Island oysters, four years old, transplanted in 1881 to Lake's Bay, New Jersey. Alex. Fish.
33470. Hog Island oysters, three years after planting. Peter Watkins.

COAST OF SOUTH CAROLINA, GEORGIA, AND FLORIDA.

Vicinity of Charleston, S. C.

33591. Bored by *Cliona*. Two and a half years old. C. C. Leslie.
33592. Two and a half years old. C. C. Leslie.
33593. From Wadmelaw River. Cultivated. Four years old. C. C. Leslie.
33594. From Togodo River. C. C. Leslie.

Vicinity of Savannah, Ga.

33589. Two and a half years old. G. S. Hobbs.
33590. Four years old. G. S. Hobbs.

East coast of Florida.

33588. Indian River. Natives. G. S. Hobbs.

West coast of Florida.

32806. Cat Point. Lieut. Kossuth Niles, U. S. N.
32807. Lieut. Kossuth Niles, U. S. N.
32805. Appalachicola Bay. Lieut. Kossuth Niles, U. S. N.
32808. Raccoon oysters. Lieut. Kossuth Niles, U. S. N.

COAST OF LOUISIANA AND TEXAS.

32800. Timbalier Bay, Louisiana. W. Alex. Gordon.
32801. Southwest Pass, Louisiana. W. Alex. Gordon.
32802. Bayou Cook, Louisiana. W. Alex. Gordon.
32803. Four Bayous, Louisiana. W. Alex. Gordon.
32804. Grand Lake, Louisiana. W. Alex. Gordon.
33597. Galveston Harbor, Texas. Master C. McR. Winslow, U. S N.
33598. Corpus Christi, Tex. Master C. McR. Winslow, U. S. N.

PACIFIC COAST OF THE UNITED STATES.

Ostrea lurida, Cpr.

32879. Crescent City, Cal. W. H. Dall.
32809. Shoalwater Bay, Washington Territory. H. Hemphill.
32799. San Diego, Cal. H. Hemphill.
33640. R. E. C. Stearns.

Ostrea Virginica, Gmelin.

32798. San Francisco Bay, transplanted from Newark Bay, New Jersey. H. Hemphill.

SERIES ILLUSTRATING TRADE CLASSIFICATIONS.

"Cullers."

32916. Cow Bay, Long Island. Three years old. B. J. M. Carley.
32965. Long Island Sound. Three to four years old. Hoyt Bros.

Ostrea Virginica. Gmelin—Continued.

"*Box.*"

32917. Cow Bay, Long Island. Three years old. B. J. M. Carley.
32964. Long Island Sound. Four to six years old. Hoyt Bros.

Single extra.

32918. Cow Bay, Long Island. Four years old. B. J. M. Carley.

Double extra.

32776. Cow Bay, Long Island. B. J. M. Carley,

Extra.

33568. Maurice River Cove. Five years old. Thos. J. Love.

SERIES ILLUSTRATING RAVAGES OF ENEMIES.

32956. Long Island Sound. Killed by star-fish (*Asterias forbesii*). Jas. Richardson.
32929. Long Island Sound. Killed by "hairy-whelk" (*Sycotypus canaliculatus*). Jas. Richardson.
32927. Long Island Sound. Destroyed by a whelk (*Fulgur carica* or *Sycotypus canaliculatus*). Jas. Richardson.
3151. Long Island Sound. Illustrates method of destruction by star-fish (*Asterias forbesii.*)
32928. Long Island Sound. Destroyed by "drill" (*Urosalpinx cinerea*). Jas. Richardson.
32788. Crisfield, Md. Shell covered with worm tubes. E. G. Blackford.
33566. Vicinity of New York. Shell covered with worm tubes and polyzoa. E. G. Blackford.

Ravages of boring sponge. (*Cliona sulphurea*, Verrill.)

33591. Vicinity of South Carolina. C. C. Leslie.
33377. Oyster Bay, Long Island. H. A. Townsend.
33403. Bridgeport, Conn. Wheeler Hawley.
32820. New York Bay. B. J. M. Carley.
32966. Long Island Sound. Hoyt Bros.

Ravages of boring pholad. (*Martesia cuneiformis*, Gray.)

32917. Cow Bay, Long Island. B. J. M. Carley.
33095. Rappahannock River, Virginia. G. W. Harvey.
33556. Tangier Sound. Split shells. T. W. B. Clark.
33579. Tangier Sound. Split shells in alcohol, showing pholad *in situ*. T. W. B. Clark.
33581. Tangier Sound. Split shells showing pholad *in situ*. T. W. B. Clark.
33582. Tangier Sound. Exterior of shells showing borings. T. W. B. Clark.

MODEL OF AN OYSTER-BED.

Illustrating the manner in which a natural oyster-bed is formed, the change in its condition after a period of extensive fishing, and the methods of attack of the various enemies, inhabitants of shelly areas. The vertical scale is necessarily exaggerated. Prepared by Lieut. Francis Winslow and J. Palmer.

USEFUL BIVALVES OTHER THAN OYSTERS.

Mya arenaria, Linné. Long Clam, Soft-shelled Clam, or Mananose. East coast of North America from South Carolina to Arctic Ocean. Abundant from New Jersey northward; scarce south of Cape Hatteras; abundant in San Francisco Bay, California.

32829. Canarsie Bay, Long Island. E. G. Blackford.
32955. Cape Cod, Massachusetts. E. G. Blackford.
33094. Bay of Fundy. G. F. Mathew.
33464. Ocean View, N. J. T. C. Sharp.
33474. Guilford, Conn. A. A. Foote.
*32833 (*Mya Hemphillii*), San Francisco Bay, California. H. Hemphill.

Mactra solidissima, Chemnitz. Hen Clam, Surf Clam, or Sea Clam. Florida and Gulf of Mexico to Labrador. Abundant from Delaware Bay to Cape Cod; in Casco Bay and Bay of Fundy. Low-water mark to 10 fathoms.

32869. Massachusetts Bay. W. H. Dall.

Callista gigantea, Chemnitz. Painted Clam. Southern coast of the United States.

32867. South Carolina. Dr. Wm. Stimpson.

Macoma (*sp.*) Salmon Tellen.

32874. Coast of Florida. Mr. Conrad.

Cyprina islandica, Lamarck. Sea Clam. Long Island to Arctic Ocean, in soft sand or mud, at from 10 to 100 fathoms.

33607. Vicinity of Long Island. E. G. Blackford.

Gnathodon cuneatus, Gray. Cuneate Clam. Gulf coast, vicinity of New Orleans.

32839. Lake Pontchartrain, Louisiana. Gustav Kohn.

Ensatella Americana, Verrill. Razor Fish or Razor Clam. Florida to Labrador. Common from New Jersey to Gulf of Saint Lawrence, from low-water mark to 20 fathoms.

33585. Long Island Sound. A. A. Foote.

Venus mercenaria, Linné. Quahaug or Round Clam. Abundant from Florida to Massachusetts Bay. Rare and local further north on coast of Maine, Nova Scotia, and southern shore of Gulf of Saint Lawrence. Not found on coast of Maine east of Kennebec River, nor in Bay of Fundy. The shells of *Venus mercenaria* vary so much in color and character that a number of distinct species have been described. The variations, however, are, like those of the oyster, by no means constant, and are due, principally, to the character of bottom and water. In the following series, four varieties are shown, with the intermediate types connecting them.

---

* Transplanted from the east by accident, with young oysters.

Purple-shelled variety: Exterior of shell smooth and discolored; interior more or less purple tinted about margin.

32817. Rockaway, Long Island. B. J. M. Carley.
32862. Dr. Wm. Stimpson.
32877. Dr. Wm. Stimpson.
33404. Oyster Bay, Long Island. Soft bottom. H. A. Townsend.
33419. Narragansett Bay, Rhode Island. A. A. Wilson.
33428. Ocean View, N. J. Two to three years old. T. C. Sharp.
33509. Lake's Bay, N. J. Muddy bottom. Five years old. Alex. Fish.
33560. Barnegat, N. J. Allan Neill.

White-shelled variety: Exterior, rough, with high, thin concentric ribs; interior, white.

32862. Dr. Wm. Stimpson.
32838. Barataria Bay, Louisiana. Gustav Kohn.
33404. Oyster Bay, Long Island. Soft bottom. H. A. Townsend.
33405. Seaville, N. Y. J. W. Gandy.
32818. New York. B. J. M. Carley.
33446. East Greenwich, R. I. A. A. Wilson.
33478. Somers Point, N. J. H. H. Vansant.
33560. Barnegat, N. J. Allan Neill.

Intermediate: Exterior, rough; interior, purple tinted.

32862. Dr. Wm. Stimpson.
33478. Somers' Point, N. J. H. H. Vansant.
32877. Dr. Wm. Stimpson.
33428. Ocean View, N. J. Two to three years old. T. C. Sharp.
33472. New Rochelle, N. Y. A. A. Foote.
33404. Oyster Bay, Long Island. Soft bottom,
33560. Barnegat, N. J. Allan Neill.

Intermediate: Exterior, smooth; interior, white.

33472. New Rochelle, N. Y. One to four years old. A. A. Foote.
32877. Dr. Wm. Stimpson.
33560. Barnegat, N. J. Allan Neill.
33478. Somers Point N. J. H. H. Vansant.
33404. Oyster Bay, Long Island. Soft bottom. H. A. Townsend.
33421. East Greenwich, R. I. A. A. Wilson.
33446. East Greenwich, R. I. A. A. Wilson.

Elongated variety:

33405. Seaville, N. J. J. W. Gandy.
32817. Rockaway, N. J. B. J. M. Carley.

Snub-nosed variety:

32862. Dr. Wm. Stimpson.
33419. Narragansett Bay. A. A. Wilson.
32819. Fire Island, Long Island. B. J. M. Carley.

Mytilus edulis, Linné. Edible mussel. Arctic Ocean south to North Carolina on the eastern coast, and to Monterey on the Pacific coast of the United States. Abundant from New Jersey northward.

33349. East Greenwich, R. I. A. A. Wilson.
33583. Stony Creek, Long Island Sound. A. A. Foote.
33629. Vineyard Sound. U. S. Fish Commission.

Modiola plicatula, Lamarck. Grooved mussel. Georgia to Casco Bay, Maine; more rare and local further north. Abundant from New Jersey to Massachusetts.

33596. Coast of New Jersey. U. S. Fish Commission.
33486. Ocean View, N. J. T. C. Sharp.
33457. East Greenwich, R. I. A. A. Wilson.

Modiola modiolus, Turton. Horse Mussel. Greenland south to New Jersey on the eastern coast and south to Monterey on the Pacific coast of the United States. Abundant north of Cape Cod, and about Long Island and Staten Island.

33662. Georges Bank. R. H. Hurlburt.
33608. Vicinity of New York. E. G. Blackford.
34643. Stones, shells, &c., attached by byssus. E. G. Blackford.

Pecten irradians, Lamarck. Scallop. Florida and northern shores of the Gulf of Mexico to Cape Cod. Rare and local further north. Abundant from Long Island Sound southward.

33608. Great South Bay, Long Island. F. C. Dayton.

East Greenwich, R. I.

33567. Series illustrating color variations. A. A. Wilson.

SERIES ILLUSTRATING GROWTH.

33431. Size during first week in September.
33432. Size during second week in September.
33433. Size during third week in September.
33434. Size during fourth week in September.
33435. Size during first week in October.
33436. Size during second week in October.
33437. Size during third week in October.
33438. Size during fourth week in October.
33439. Size during first week in November.
33440. Size during second week in November.
33441. Size during third week in November.
33442. Size during fourth week in November.
33443. Size when about one year old—marketable.
33444. Size when fifteen months old.
33445. Size when twenty-seven months old (very rare).

Pecten tenuicostatus, Mighels. Great or Giant Scallop. New Jersey to Labrador. Rare and local south of Cape Cod. Abundant in Frenchman's Bay, Mount Desert. Common in Massachusetts and Casco Bays and Bay of Fundy.

33631. Cape Cod, Massachusetts. U. S. Fish Commission.
32979. Castine, Me. Showing ravages of boring sponge (*Cliona sulphurea*). A. R. Crittenden.
32980. Castine, Me. Showing ravages of boring sponge (*Cliona sulphurea*). L. J. Heath.

Argina pexata, Gray. Bloody Clam. Florida and northern shores of the Gulf of Mexico to Cape Cod. Rare and local further north. Abundant from New Jersey to Massachusetts.

33570. Maurice River Cove, Delaware Bay. Thos. J. Love.
33460. East Greenwich, R. I. A. A. Wilson.

Glycimeris generosa, Gould. Geoduck or Giant Clam. Pacific coast, in rivers and estuaries, from Puget Sound to San Diego. Not common as southern limit is approached, nor very abundant at any point.

33614. California coast. R. E. C. Stearns.
33615. California coast. R. E. C. Stearns.

Siliqua patula, Dixon. Razor Clam. From Vancouver's Island to San Diego. Coast of California. Abundant in Oregon and Washington Territory and adjacent islands.

32881. W. H. Dall.

Semele decisa, Cpr. Flat Clam. San Diego and California coast.

32847. San Diego, Cal. H. Hemphill.

Platyodon cancellatus, Conrad. Date Fish. San Diego, Santa Barbara, and San Francisco, Cal. Coast of California.

32850. Baulinas Bay. H. Hemphill.

Zirphœa crispata, Mörch. Date Fish. Northwest coast of America to California, Puget Sound, Vancouver Island, San Diego, and San Pedro.

32856. Baulinas Bay. H. Hemphill.
33641. R. E. C. Stearns.

Macoma nasuta, Conrad. Tellen. Kamschatka to San Diego, Cal. Littoral, 3 feet in mud.

32848. San Francisco market. H. Hemphill.

Saxidomus aratus, Gould. Round Clam. San Francisco Bay and San Diego, Cal.

32843. San Diego, Cal. H. Hemphill.

Chione succincta, Valenciennes. Little Neck Clam. Coast of California.

32841. San Diego, Cal. H. Hemphill.

Chione simillima, Sowerby. Little Neck Clam. San Francisco to San Diego, Cal.

32842. San Diego, Cal. H. Hemphill.

Tapes staminea, Conrad. Little Neck Clam. Coast of California. Littoral, 2 feet in mud.

32854. Baulinas Bay, California. H. Hemphill.
32844. Tomales Bay, California. H. Hemphill.

Tapes laciniata, Cpr. Little Neck Clam. Monterey and San Diego, Cal.

32846. San Diego, Cal. H. Hemphill.

USE OF ORNAMENTAL BIVALVES OTHER THAN THOSE AFFORDING FOOD.

Pearl-producing.

Unionidæ.

Unio (various sp.). River Mussels. Fresh water streams of the United States. Abundant in the rivers of the Western States.

25986 to 26010. Series having both valves polished. From Dr. C. A. Miller, Cincinnati, Ohio. Comprises the following species:

Unio metanevrus, Rafinesque.
alatus, Say.
ornatus, Lea.
verrucosus, Barnes.
gibbosus, Barnes.
rectus, Lam.
cylindricus, Say.
pyramidatus, Lea.
tuberculatus, Barnes.
luteolus, Lamarck.
circulus, Lea.
anodontoides, Lea.
pustulosus, Lea.
crassidens, Lamarck, &c.

26092*a*. River mussel affording pearl-shell, illustrating application of raw material. Cincinnati, Ohio. D. Shaffer.

26092. Carvings, from pearl-shell afforded by river mussels, for use as studs, buttons, pins, brooches, &c. Cincinnati, Ohio. D. H. Shaffer.

26092*b*. Pearls derived from river mussels. Cincinnati, Ohio. D. H. Shaffer.

Aviculidæ.

Margaritiphora fimbriata, Dkr. Pearl Oyster. Head of Gulf of California to Panama. Common in the region of La Paz, Lower California, and in vicinity of Panama.

13507. Colonel Jewett.
3624. Illustrating formation of pearls. Panama. Colonel Jewett.
32836. Gulf of California. J. Xantus.
——. Polished shell. Chicopee, Mass. Jas. T. Ames.
32921. Made into artificial fish-bait. Boston, Mass. Bradford & Anthony
32922. Made into artificial minnow. Boston, Mass. Bradford & Anthony
——. Series of buttons, studs, stopper-caps, &c. Manufactured from, and showing application of, American pearl-oyster shell. Furnished by A. B. De Frece & Co., 428 Broadway, New York.

Otherwise useful and ornamental.

Composition shell-work for box-covers and frames, made by gluing shells in mosaic.

29527. Basket. Made from Florida shells. E. F. Gilbert, Jacksonville Fla.
22210. Basket. Made from Florida shells. Mrs. Mott, Jacksonville, Fla
22209. Frame. Made from Florida sea-shells. Mrs. C. E. Mott, Jacksonville, Fla.
22211. Easter Cross. Made from Florida shells. Mrs. Mott, Jacksonville.

29526. Shell flowers. Made from Florida shells. E. F. Gilbert, Jacksonville, Fla.
32869. "Hen Clam" (*Mactra solidissima* Chem). Painted inside and used for catch-alls.
32840. Cuneate clam (*Gnathodon cuneatus*). Semi-fossil (in shell heaps); used for macadamizing roads. Lake Salvador, Louisiana. Gustav Kohn.

Injurious bivalves.

Teredo. SHIP-WORM.

T. navalis, Linné. Florida to Vineyard Sound. *T. megotara*, Hanley. Massachusetts to South Carolina. *T. Thomsonii*, Tryon. Massachusetts and Buzzard's Bay. *T. dilatata*, Tryon. Massachusetts to South Carolina. *Xylotrya fimbriata*, Jeffreys. Long Island to Florida.

Specimens of wood showing ravages.

32982. Bangor, Me. (Brig H. B. Emory.) C. H. Parker.
32908. In lignum-vitæ wood Gloucester, Mass. Samuel Elwell, jr.
33106. (*Teredo chlorotica*, Gld.) Wood's Holl, Mass. Vinal N. Edwards.
33105. (*Xylotrya fimbriata*, Jeffr.) Wood's Holl, Mass. Vinal N. Edwards.
32984. (*Teredo navalis?* L.) New Haven, Conn. A. E. Verrill.
32902. (*Teredo* sp.) Showing damage effected in white-pine wood in one year. Pier 44, North River, N. Y. W. T. Pelton.
32901. Showing damage to hard-pine wood effected in one year. Charleston, S. C. W. T. Pelton.
32983. Schooner Carrie Melvin; done in six weeks. Charleston, S. C. A. G. Hunt.
32815. (*Teredo* sp.). Gulf coast. Dewey.
32816. Showing lining of tubes. Texas. Dr. Schott.
19405. (*Xylotrya* sp.) Coast of Oregon. J. G. Swan.
33616. (*Teredo* sp.) Showing ravages in six weeks. Indian River, Fla. G. S. Hobbs.
33617. (*Teredo* sp.) Showing ravages in three months. Indian River, Fla. G. S. Hobbs.
33638. (*Teredo* sp.) Wood showing ravages. U. S. Fish Commission.
33630. *Teredo megotara*. Hanley. Off Martha's Vineyard. (Specimens in alcohol.) U. S. Fish Commission.

Martesia cuneiformis, Gray. Boring pholad. Southern coast of the United States to New Jersey. Rare and local further north, and in Long Island Sound. Abundant on oyster-beds of Chesapeake Bay.

33580. Tangier Sound, Maryland. T. W. B. Clark.
(For illustration of ravages, see oyster section, "Ravages of enemies.")

Enemies other than mollusca, inhabiting oyster-beds and destructive to shell-fish.

Panopeus Sayi, Smith. Mud Crab.

3628. Off Martha's Vineyard. U. S. Fish Commission.
(See Section, *Crustacea, Echinoderms, &c.*)

Cancer irroratus, Say. Rock Crab.

3630. Vineyard Sound. U. S. Fish Commission.
(See Section, *Crustacea, Echinoderms, &c.*)

Carcinas Mœnas, Gould. (*Carcinus granulatus*, Say.) Green Crab.

3627. Vineyard Sound. U. S. Fish Commission.
(See Section, *Crustacea, Echinoderms, &c.*)

For other crabs see Section, *Crustacea, echinoderms, &c.*

Asterias Forbesii, Verrill. (*Asterias arenicola*, Stimpson.) Green Starfish.

5559. Vineyard Sound. U. S. Fish Commission.
(See Section, *Crustacea, Echinoderms, &c.*)

Microciona prolifera, Verrill. Red, Branching Sponge.

531. Wood's Holl, Mass. U. S. Fish Commission. (Not directly injurious.)

(See Section, *Crustacea, Echinoderms, &c.*)

Cliona sulphurea, Verrill. Boring Sponge.

1010. Vineyard Sound. U. S. Fish Commission.
(See Section, *Crustacea, Echinoderms, &c.* For ravages, see oyster section, "Ravages of enemies.")

Archosargus probatocephalus (Walb.) Gill. Sheepshead.

See "Fishes." Family *Sparidæ.*

Pogonias chromis, Lacep. Drum.

See "Fishes." Family *Sciænidæ.*

COMMENSAL.

Pinnotheres ostreum, Say. Oyster Crab. Commensal with southern oysters and with northern in rivers where southern oysters have been long planted.

4991. New York market. E. G. Blackford.

Pinnotheres maculatus, Say. Commensal with edible mussel (*Mytilus edulis*) and Great Scallop (*Pecten tenuicostatus*).

For specimen see Section, *Crustacea, Echinoderms, &c.*

SHELL-FISH FISHERY.

VESSELS AND BOATS.

55804. Model of an oyster schooner. Chesapeake and Delaware Bay type. Used in dredging oysters. U. S. Fish Commission.

26536. Model of an oyster schooner. (Scale, 1 inch to the foot.) Chesapeake and Delaware Bay type. Used in dredging oysters. T. B. Ferguson.

25002. Model of a Chesapeake canoe-pungy. (Scale, 1 inch to the foot.) Used in dredging oysters. T. B. Ferguson.

55807. Model of an oyster pinkie. U. S. Fish Commission.

42758. Model of a Chesapeake oyster-pungy. T. B. Ferguson.

25003. Model of a Chesapeake oyster-canoe. (Scale, 1 inch to a foot.) Made from two logs and used in "tonging" oysters in Chesapeake Bay. T. B. Ferguson.

22217. Model of a fishing boat used by Chinese fishermen on the Pacific coast in shell-fishery. Livingstone Stone.

22213. Model of a fishing boat used on the Pacific coast in the shell-fishery. Livingstone Stone.

25657. Model of a Nantucket dory. (Scale, 1 inch to the foot.) Used in gathering clams for bait. W. H. Chase.

12678. Model of a New England dory. (Scale, 1 inch to the foot.) Used in gathering and transplanting clams. Starling & Stevens, Ferryville, Me.

24752. Model of a Connecticut sharpie. (Scale, 1 inch to the foot.) Used in the oyster and scallop fisheries of Long Island and Long Island Sound. H. C. Chester.

29537. Model of Providence River cat-boat. Used in scallop fishery. J. M. K. Southwick.

—— Crayon showing clamming dories on the beach. U. S. Fish Commission.

—— Crayon showing Connecticut steam oyster-dredger "W. H. Lockwood," at work off New Haven. U. S. Fish Commission.

The types, such as cat-boats, dories, sloops, and small schooners, used along the New England coast in the seine and line fishing, are also employed indiscriminately in the shell-fish fisheries, especially those of the oyster and scallop. In Long Island Sound, of late years, these craft have been superseded, however, to a great extent, by the steam dredging vessels. For other models see Industrial Exhibit.

IMPLEMENTS.

57570. Oyster dredge used by Connecticut steam oyster dredgers. When of this size but two are used, one on each side of the vessel. With smaller sizes, four are operated at the same time. C. D. Hall.

57089. Oyster dredge with teeth. Style in general use in Chesapeake and Delaware Bays. U. S. Fish Commission.

57090. Oyster scrape without teeth. Style in general use in Chesapeake and Delaware Bays, in shallow water and on soft bottom. U. S. Fish Commission.

31792. Model of an oyster dredge, and patent "winder." Showing method of operating the dredging apparatus. C. S. Belbin.

57092. Improved "winder" or windlass for hauling in oyster dredges. U. S. Fish Commission.

57693. Oyster tongs, 10-foot handles and 10 teeth. Galvanized iron frame. U. S. Fish Commission.

57694. Oyster tongs, 10-foot handles and 10 teeth. Galvanized iron frame. U. S. Fish Commission.

26110. Oyster tongs, 8-foot handles and 12 teeth. Head of wood, frame of small brass rods. S. Salisbury.

26109. Oyster-tongs. 8-foot handle and 8 teeth. Head of wood, frame of small brass rods. S. Salisbury.

25205. Oyster-tongs. 8-foot handle and 10 teeth. Frame, head, and teeth of galvanized iron. Wilcox & Crittenden.

29111. Oyster-nippers. 8-foot handle and 3 teeth, $2\frac{1}{2}$ inches long. S. Salisbury.

57806. Model of oyster-tongs. W. P. Haywood.
57557. Scallop-dredge, Narragansett Bay. For use on hard bottoms. A. A. Wilson.
57558. Scallop-dredge, Narragansett Bay. "Slider" style; for use on grassy bottoms. A. A. Wilson.
57559. Scallop-dredge, Narragansett Bay. "Kettle-bail" style; for use on muddy bottoms. A. A. Wilson.
57087. Scallop-dredge, New Bedford. Old style with twine net. J. T. Brown.
57088. Scallop-dredge, New Bedford. New style, with iron-mesh net. J. T. Brown.
57091. Clam rake. Provincetown, Mass., style. Used in taking sea-clams. (*Mactra solidissima.*) J. T. Brown.
57695. Clam rake. Nantucket style. 13-foot pole, 23 teeth, twine net. Used in taking sea-clams. (*Mactra solidissima.*) U. S. Fish Commission.
29466. Clam hoe. Provincetown, Mass. Wm. H. Hesbolt.
29437. Hand-claw. Used for gathering "hen" clams and scallops. Wellfleet, Cape Cod, and coast of Maine. M. W. Grant.
36043. Clam rake. 23-foot pole, 16 teeth 6 inches long. Used in taking "quahaugs" (*Venus mercenaria*) and "hen" clams. (*Mactra solidissima.*) U. S. Fish Commission.
36040. Clam rake. 18-foot pole, 16 teeth 6 inches long. Used in taking "quahaugs" (*Venus mercenaria*) and "hen" clams. (*Mactra solidissima.*) U. S. Fish Commission,
36045. Clam rake. Wellfleet style. U. S. Fish Commission.
36046. Clam rake. Wellfleet style. 5-foot handle, 13 teeth, 5 inches long. Used in taking "quahaugs" (*Venus mercenaria.*) U. S. Fish Commission.
36047. Clam rake. Wellfleet style. 5 foot handle, 17 teeth 6 inches long. Used in taking "quahaugs" (*Venus mercenaria.*) U. S. Fish Commission.
—— Clam rake (model) used in collecting sea-clams. (See model of Nantucket dory.)
—— Oyster shovel (model). (See model of Chesapeake oyster canoe.)

The moss rakes, large and small, and various agricultural implements such as spades, shovels, hoes, &c., are used in taking clams and other shell-fish; but they are not exhibited in this section.

OYSTER CULTIVATION.

Tracing of the official map of the Shell-Fish Commissioners of the State of Rhode Island, showing location of oyster-farms in the Providence River and Narragansett Bay, and illustrating the methods employed in assigning portions of the bottom for oyster cultivation, and in maintaining the buoys and marks in proper position. Scale $\frac{1}{10000}$. Index plan of the above. Scale $\frac{1}{80000}$.

Copy of the official map of the Shell-Fish Commissioners of the State of Connecticut, showing the natural beds, the area under cultivation, and the area designated or applied for but not yet improved; and illustrating the system adopted by the State of Connecticut for the purpose of encouraging the oyster industry.

Copy of the the triangulation sheet of the Connecticut commission. Contributed by the shell-fish commission of the State of Connecticut.

Copy of the map of the town commissioners of Patchogue, Long Island, showing the oyster-farms and areas belonging to the various oyster companies and oyster associations of Great South Bay, Long Island.

For laws and regulations governing oyster-farming in the foregoing localities, see "Introduction" and reports of commissioners in the collection of publications.

METHODS OF PRESERVING AND TRANSPORTING SHELL-FISH.

Models of the apparatus used in "steaming" oysters, including the following articles:

Tram-car of iron, on iron wheels, for holding oysters while in steam-chest, and transporting them thence to the opening room.

Steam-chest of oak, lined with iron and fitted with appliances for admitting steam when doors are closed. Doors movable vertically and close fitting.

Iron tracks for car.

Turn-table for car.

Tin pot fitted to hook to side of car and into which the oysters are put as soon as opened.

Sieve in which the oysters are put for washing after reception from openers.

Table upon which the oysters are placed after washing and where the cans are filled and weighed.

Crate or basket, circular in form and of iron, into which the cans are piled, regularly, after being filled. Models of cans shown in position.

Dray for transporting cans.

Derrick for raising crates in transporting them from process-kettle to cooling-tub.

Process-kettle, circular, of iron, lid closing hermetically, and fitted with steam-pipes and thermometer. In the course of preparation the crates containing the cans of oysters are placed in the kettle, the lid closed, and the steam turned on.

Cooling-tub, of wood, containing cold water. The crates with contents are transferred to this tub, after steaming, in order to cool them.

Capping-table. The cans are transferred to this table, from the cooling-tub, and there have the caps soldered on.

Capping-iron (natural size). This is an arrangement of an ordinary soldering iron, so as to facilitate the soldering of the cans.

Models of the apparatus used in opening and packing oysters.

Shucking trough, with stand for workman, hammer, knife, block, two buckets; one to receive small oysters, the other for "selects."
Skimmer and gallon pot for receiving oysters from the shuckers.
Three tubs, one to receive small oysters, one for "selects," and one holding water.
Cullender in which the oysters are washed.
Shake-bucket for transferring oysters to and from tubs.
Table holding the cans to be filled.
Dipper for holding water.
Cup for holding oysters.
Cup for holding water.
Funnel for filling cans.
Case in which cans are packed for shipment.

Implements used—natural size.

Set of measuring cups.
"Dipper."
Set of funnels.
Shake-bucket.
Gallon pot.
Hammer.
Knife.
Shucker's buckets.
Block.
Case containing cans. A. Booth & Co., Baltimore, Maryland.
Oyster tubs and buckets used in transporting shell-fish. W. S. Robinson & Co., New Haven, Connecticut.
Oyster-tubs used in the Western States in transporting oysters. Mann Bros., Chicago, Illinois.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

E.

THE WHALE FISHERY

AND

ITS APPLIANCES.

BY

JAMES TEMPLE. BROWN,

Assistant in the Department of Art and Industry, U. S. National Museum.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.

INTRODUCTION.

Pursuant to instructions received from the United States Commissioner of Fish and Fisheries, to take charge of the collection and preparation of an exhaustive exhibit illustrative of the whale fishery, to be displayed at the International Fisheries Exhibition of the present year, I proceeded to the principal whaling ports of the eastern coast. The field work was conducted mainly at New Bedford, Provincetown, Nantucket, Edgartown, and New London. The object of my visits being known, the whalemen, agents, owners of vessels, and others interested in this industry, with one accord, offered their services to the Government, and generously responded to its call, in order that the vast machinery of the whale fishery of the United States might be represented in the friendly contest among all the prominent maritime nations of the world. From the fresh material collected on this tour, as well as from objects previously deposited in the Fisheries Division of the National Museum, selections have been made and prepared for final exhibition in London. In the preparation of the whaling craft it has been my desire that the objects should be exhibited as nearly as possible in the same condition in which they are usually placed on whaling vessels. The only exceptions allowed to this plan of operations occur in regard to several objects nickel-plated by one manufacturer, who is anxious to display his goods in an attractive manner. As is well known, the best kinds of wood, rope, iron, and steel are sought by whalemen, and the manufacturers, either through pride or fear of competition, employ the best grades of material, and finish some of their goods in an artistic manner.

The exhibit embraces, for the most part, the apparatus used at present; but some rare and interesting implements that were hastily constructed on vessels in times of necessity, as well as some that were developed as experiments both at sea and ashore, have also been included. The unique designs of the last-named series afford an interesting study. Some of them are obsolete, while others have developed into more perfect and acceptable forms, and though they have, in part, been superseded by improved contrivances, they have been, nevertheless, actively employed, and are worthy of prominent places.

Several objects made and used by the Eskimo tribes of the Hudson Bay region appear in this series. New Bedford has been in the habit of sending two vessels every season to Hudson Bay, but owing to the small profits, as well as the dangerous method of prosecuting this fishery, it is more

than probable that this ground will be abandoned. The vessels, usually schooners or brigs, leave their port in late spring, and after killing as many whales during the season of fishing as it is possible to do, go into winter quarters at Marble Island, where they are frozen in, and when the ice goes out make their home passages, arriving at New Bedford about September or October. When the whalemen go into winter quarters the coastal tribes build their igloos upon the ice and shores about the vessels. During the winter the Eskimo are anxious to trade, and many interesting articles of ethnological value, as well as objects of natural history, might be obtained in this manner. The whalemen—that is, the crew—trade merely for such curiosities as have an interest for them, while the vessel obtains furs and skins of land mammals.

In the season of 1881–'82, two vessels, the brig "George and Mary" and the schooner "Helen Rodman," were dispatched to Hudson Bay. The latter was wrecked shortly after her arrival. Her crew returned on the "George and Mary," which arrived October 3, 1882, and from this vessel I obtained quite a number of articles, consisting of bows and arrows, domestic utensils, and several suits of fur clothing, besides boots, shoes, and stockings, some of which are included in the series sent to London.

The returning vessel brought in part of a cargo of oil and whale-bone, and skins of the polar bear, musk-ox, and foxes.

DISPOSITION AND ARRANGEMENT OF OBJECTS.

Owing to the weight and size of some very essential objects employed in this fishery, it was decided not to send them to London, as considerable risk, delay, and inconvenience might be experienced, both in packing and in transportation; but they will be permanently installed in the National Museum. Such objects as have been selected are arranged singly and in groups, as follows: (1) Models; (2) a full sized whaleboat, with apparatus of capture; (3) upright screens, 92 by 95 inches, containing harpoons, guns, and lances; (4) a frame-work of wood, containing implements used in manipulating dead whales, blubber, and oil; (5) glass cases, containing articles of decorative art, and "scrimshaw" work peculiar to whalemen; curiosities; a series of blubber-knives; papers carried by outward-bound vessels; whalemen's journals of voyages; samples of lines and ropes used in this fishery, and accessories; and (6) a series of photographs.

1.—MODELS.

In this group are represented the whaleship, the "camels," the try-works common to all whaling vessels, and the present American whaleboat.

SHIP.—When coast-whaling was first essayed by Americans, the smaller class of vessels, such as sloops and schooners, were employed, but very short voyages were made. When, however, it was found necessary, as well as profitable, to "whale out in the deep," the smaller class of vessels gave way to barks and ships, principally the latter. These were invariably sailing vessels, until, in 1880, a bark with auxilliary steam-power, the "Mary and Helen," afterwards the "Rodgers," was successfully introduced in the North Pacific, and subsequently similar vessels owned in New Bedford and San Francisco have been sent to the same grounds. The largest fleet employed in this industry, consisting of schooners, barks, brigs, and several ships, varying from 66 to 440 tons, is owned by New Bedford. The majority of these are barks, which, as is well known, are as large as ships, the only difference being the "rig." The vessels hailing from San Francisco are principally barks, varying from 175 to 533 tons, the latter being the tonnage of the recently constructed steamer "Bowhead." The vessels owned at Provincetown, with the exception of one brig, the "D. A. Small," 119 tons, are schooner-rigged, and vary from 69 to 117 tons. Boston owns one bark of 395 tons, and several brigs and schooners of from 92 to 123 tons. Edgartown has two barks, of 301 and 314 tons, respectively, and several schooners, varying from 89 to 100 tons. New London is engaged in sealing, as well as whaling, and sends from her wharves schooners of from 134 to 250 tons. Stonington owns two schooners of 70 tons each, and Marion one or two schooners of about 84 tons.

CAMELS.—Owing to the difficulty experienced by the heavily laden whale-ships in crossing Nantucket Bar, a kind of lighter, consisting of water-tight compartments, was constructed in 1842. Since the decline of the fishery at this port the camels have been destroyed, and about the only pieces of this peculiar craft that have been saved are to be found in the garden of Mr. F. C. Sanford, of Nantucket, having been utilized in the construction of a dike or terrace.

TRY-WORKS.—The try-works peculiar to whale-ships are built of brick and mortar, framed with wood, the base resting upon the wooden sheathing of the deck. It was formerly the custom to use three try-pots, but at the present time none of the vessels have more than two. The early form of try-pot employed by Americans was manufactured in Scotland, some of which are still to be found sunning themselves about the docks at New Bedford and elsewhere, being known as the "English pot," but they are not used at present. The majority of American vessels are now fitted with try-pots manufactured at the New Bedford foundry. The largest of these weighs 1,200 pounds, with a capacity of 200 gallons; but smaller sizes of about 180 gallons are more generally used.

There is also included in this series the "head," full size, of the whaleboat, with a lay figure of the boatsteerer in the act of darting a harpoon.

2.—THE WHALEBOAT.

American whaleboats have smooth bottoms, báttened seams, logger-head aft, five thwarts, and invariably mast, mainsail, and jib. The lengths vary from twenty-eight to twenty-nine or thirty-feet. The term "craft" includes the harpoons, lances, boat-spade and boat-hook, but is oftentimes more specifically applied to the implements used to strike and kill the whale. "Boat-gear" comprehensively includes the entire outfit of the boat, but more particularly refers to the implements other than craft, such as the boat-bucket, piggin, water-bucket, line-tubs, lantern-keg, oars, paddles, and the like. It also includes the warps, but in this classification I shall mention them separately, as the main-warp or whale-line, lance-warps, short-warp and the boat-warp.

A boat's crew consists of six men; the officer of the boat, who is one of the mates, with the title of "boat-header"; the harpooner, a petty officer whose rank is next to that of a mate, known as "boat-steerer;" and five oarsmen. The boat-steerer strikes the whale, and the officer usually kills it. The oarsmen have their appointed places in the boat, and their respective duties to perform as whalemen.

3.—HARPOONS, GUNS, AND LANCES.

The implements used in the capture, pre-eminently the most important, are arranged upon the faces of four screens with maroon backgrounds, and, as far as possible, the serial and chronological order has been preserved. The first screen contains forty-seven hand-harpoons, among which may be found the forms used by the Basque, Dutch, English, French, and American fishermen, as well as a full series of the various types introduced from time to time by Americans. The second screen contains the primitive and modern types of the whaling guns, the English swivel gun, and the rocket-gun—seventeen objects in all. Upon the third screen the numerous patterns of the gun-harpoons are arranged, comprising thirty-three objects. The fourth screen is devoted to the explosive and non-explosive lances, the explosive harpoons, the rocket-bomb, seal, sea-elephant, and walrus harpoons, comprising thirty-eight implements.

These four screens may be compared to four volumes—each implement constituting a chapter—containing an exhaustive treatise on the past and present methods of the capture of the whale adopted by all nations that have participated in this fishery. The chapters, though complete in themselves, are subordinate, the subjects of the one being merely an introduction to the other, and may be used as stepping-stones as we proceed from the beginning of the seventeenth century to the present time.

HAND-HARPOONS.

The harpoons thrust by hand for striking whales may be divided into four classes: (1) the typical harpoon; (2) the common toggle-iron, and

the darting-gun harpoon; (3) the hump-back iron; and (4) the prussic-acid iron.

(1) THE PRIMITIVE HARPOON.—Of this class there are properly two types: the typical harpoon with a fixed head and two barbs, and the harpoon with a fixed head and one barb. These are familiarly known as the "two-flued" and "one-flued" irons. Innovations have been made by hinging or pivoting one or two additional barbs or "flukes" in the rear of the heads of both types. None of this class are used at present by American whalemen, except possibly at times the former on the California coast, for raising "sunk" whales.

(2) THE TOGGLE-IRON.—The improved harpoon has a movable barb, known as the "toggle," pivoted at its center to the anterior end of the shank. When the instrument is to be used, the toggle is adjusted in a position parallel to the shank, and held, with the cutting point forward, by a small wooden peg. When darted into the whale the peg is broken by the resistance upon the whale line, the toggle is thrown at right angles to the shank, somewhat in the form of the letter T, and becomes transfixed in the ligamentous flesh.

The heads, toggles, or flukes, as they are also termed, may be slotted, or recessed, for the reception of the shanks; or the ends of the shanks may be slotted and the barbs pivoted between the cheeks. The latter is known as the "Temple toggle," or "Temple gig," having derived its name from the inventor, a colored man, Lewis Temple, of New Bedford, Massachusetts, who first made this kind of harpoon in about 1847 or 1848. Another mode adopted by the early manufacturers for holding the toggle in position when darted, was by means of rope, iron, or leathern grommets, which gave to the instruments the name of "grommet-irons," or "grummet-irons," as they were more frequently called. The instruments, with heads mortised for the ends of the shanks and held in position with wooden pegs, are exclusively employed by all American whalemen of the present day for fastening the whale to the boat.

To this class also belongs the present walrus-iron, which is in every particular, with the exception of size, a counterpart of the improved harpoon, and is used by whalemen in the Arctic Seas for the capture of walrus. This kind of harpoon was formerly made with a double-barbed fixed head.

Friderich Martens, in an account of a whaling voyage to the Greenland fishery during the year 1671, says: "The harpoon for a sea-horse (*Trichecus Rosmarus*, walrus or morse),* and the launce also, are short, of the length of one span, or one and a half, and an inch thick, and the wooden staff thereof is about six foot long; the harpoon for a whale is much too weak to pierce his thick skin withal, yet both of them are very well tempered and of good tough iron, and not much hardened."†

* Rosmarus obesus (Illig.) Gill.

† Hakluyt Society, vol. 18, p. 90.

The same author also says, in continuation of his account of the capture of the walrus, that "when they dart the harpoon at them, they always take the opportunity to do it when he is precipitating himself from the ice, or when he diveth with his head under water, for then his skin is smooth and extended, and therefore the harpoon striketh through the skin on his back the better; but when he lyeth and sleepeth, his skin is loose and wrinkled, so that the harpoon doth not pierce the skin, but falls off."

DARTING-GUN HARPOON.—The main difference between the darting-gun harpoon and the common toggle-iron is, that instead of terminating in a socket for the handle or "pole," the former has a tapering blunt point, which is intended to be placed, or, technically, "ships" into two lugs on the barrel or lock-case of the darting-gun; and also that it has a projecting iron eye, or loop, welded to the shank near the butt, into which one end of the iron-strap should be made fast. Further reference will be made to this iron in connection with the darting-gun.

(3) THE HUMPBACK-IRON.—A toggle-iron of large proportions, intended to be used only in raising sunk whales (*Megaptera* sp.) principally. Harpoons of this character are of the average length. The shanks are made of wrought iron, about 1 inch in diameter, and the heads or toggles about 10 or 10½ inches long, or almost twice the length of the ordinary toggle, and heavier. These irons are thrown into the "neck" (properly speaking the whale has no neck) or into the region about the spiracles of the humpback whale, where the blubber is exceedingly tough, as this species almost always sinks when dead. The whale remains at the bottom for two or three days, and becoming somewhat buoyant by the gases generated by incipient decomposition, it is very materially aided in making its reappearance upon the surface by the whalemen in their boats, who haul upon the large lines which are attached to the harpoons.

(4) THE PRUSSIC-ACID HARPOONS.—These harpoons were used, to a limited extent, to kill whales with prussic acid. The two instruments of this character in this series, it is supposed, were made in France and brought to Nantucket as patterns by which others might be made and introduced into the American fleet. The use of this kind of harpoon was soon abandoned, as several of the crew of a French ship were poisoned when handling the blubber of a whale killed by the acid. Although instruments of this type were carried by several American vessels, notably the ship "Susan," of Nantucket, and others, none of them, so far as the record shows, have been used, the crews having been deterred by the disastrous results experienced by the French.

POLES, STRAPS, AND SHEATHS.—One end of a rough hickory pole, oftentimes with the bark attached, is inserted into the socket of the hand-harpoon. The shank at its junction with the socket, or the socket, is served with rope yarn, to prevent iron-rust from affecting the iron-strap.

The "iron-strap," a piece of whale-line, is fastened at one end around the shank with a round turn and a splice just above the *serving*, and has an eye-splice in the other into which the tow-line is made fast.

The iron-sheaths for the heads of the instruments are made of white pine, two pieces, gouged or *scooped* out; fastened together with wooden pins, or slugs of lead, covered with canvas, and painted; usually made at sea.

WHALING-GUNS.

The guns employed in the whale-fishery were primarily intended to impel modified harpoons known as "gun-harpoons" or "gun-irons," but have been subsequently used with better success in connection with the explosive lance.

Guns of this description may be classified as (1) small arms, (2) ordnance, and (3) rocket-guns.

This classification does not embrace the so-called "harpoon-gun," which is merely an instrument with an explosive head thrust by hand, and is properly an explosive harpoon. It should be mentioned, however, that the darting-guns are sometimes known as *harpoon-guns*.

Of the first class there are two types: the single muzzle-loaders and the single breech-loaders*; the second class embraces the swivel-guns; and the third, the Roys gun and the California whaling-rocket.

Small Arms.

The Shoulder-Gun.—The first shoulder-guns used for the capture of the whale were "muzzle-loaders," and were made with either metal or wooden stocks, and the ordinary percussion locks. Various devices have been resorted to to perfect guns of this character, some of which have not been patented. Among the most prominent may be mentioned C. C. Brand's guns with skeleton iron stocks, embracing three numbers, ranging from 1 to 3 inclusive, No. 1 being the smallest; the "Grudchos & Eggers" whaling rifle with walnut stock; the "Brown" gun with gun-metal stock and barrel; and several other kinds whose identity cannot at present be determined, among which may be mentioned those with steel barrels and walnut stocks and those with steel barrels and brass stocks.

Muzzle-loading guns were successfully employed in connection with the bomb-lances until about 1877 or 1878, at which time the improved breech-loading guns were patented and introduced. The whalemen of Provincetown, Massachusetts, prefer to use the "Brand" guns, and the whalemen of New Bedford and elsewhere invariably use the breech-loaders, which are known respectively as the "Pierce & Eggers" and the "Cunningham & Cogan." A new shoulder-gun has recently been placed on the market by H. W. Mason, of New Bedford.

The guns are discharged from the head of the boat, and are made fast

* Magazine guns are not used in the whale-fishery.

to the *hoisting-strap* by means of a lanyard to prevent them from being lost overboard, as the recoil of the shoulder-guns, for example, is often so great as to prostrate the gunners.

THE DARTING-GUN.—The darting-gun is a harpoon and bomb-gun combined, the former for fastening the whale to the boat, and the latter for simultaneously killing or wounding it by discharging the explosive lance, or *darting-bomb*, as it is termed. The darting-guns of the original pattern were muzzle loading, but more recent inventions have developed the breech-loaders which are known as the "screw-gun" and the "hinge gun." The whalemen recognize the two kinds in use at present as the "Pierce" and the "Cunningham," having borrowed these names from those of the inventors and manufacturers, Captain Eben Pierce and Mr. Patrick Cunningham, of New Bedford, Massachusetts.

The darting-guns are very successfully employed in all kinds of whaling, and are chiefly relied upon in the Arctic regions, where, before they were introduced, many whales escaped by running under ice after being *fastened to;* in which case, as it became necessary to cut the line to save the crew, the whale, as well as the harpoon and line, were lost.

One end of an ordinary pole, by which the apparatus is manipulated, is inserted in the rear end or socket of the gun. A harpoon is made especially for this apparatus, with a tapering blunt point which ships into the lugs on the barrel. The gun being charged and the lance inserted it is thrust by hand; the harpoon is buried in the whale, and the gun is automatically discharged by a long wire rod, which is in fact a trigger, extending beyond the muzzle, and which by impact operates the internal mechanism and projects the lance. The apparatus having been darted the whale starts off with the harpoon and exploded lance, and the gun may be hauled into the boat by a small rope and used in discharging other lances.

THE SWIVEL-GUN.—The swivel gun is of English origin, and was invented, according to Scoresby, in the year 1731, and used, it seems, by some individuals with success. Being, however, difficult and somewhat dangerous in its application, it was laid aside for many years. In 1771 or 1772 a new one was produced for the Society of Arts, which differed so materially from the instrument before in use that it was received as an original invention. This society took a great interest in promoting its introduction, and with some difficulty and great expense effected it.*

This kind of gun has been used by the English and Scotch whalemen in the Greenland fishery and elsewhere. American whalemen have also used the English gun, but principally in "devil fishing" and "humpbacking," in the bays and lagoons of California, "humpbacking" on the southern coast of Africa, "bowheading" in the Ochotsk sea, and in other localities where the fishery is prosecuted on soundings. Capt. John Heppingstone, of South Yarmouth, Massachusetts, tells me that

*Arctic Regions, vol. ii.

the first guns made by Capt. Robert Brown, of New London, Connecticut, were made of iron and mounted on swivels. This is the first swivel-gun, of which I have any information, manufacturd in America, with the exception of the present Mason gun.

H. W. Mason and Patrick Cunningham, of New Bedford, Massachusetts, have recently constructed a breech-loading swivel-gun, cartridge inserted in the breech, and the harpoon bomb (56376) in the muzzle, which is to be mounted in such a manner that the effects of the recoil of the gun upon the boat will be neutralized by rubber cushion-springs, for which letters-patent were issued December 12, 1882 [No. 269080, U. S. Patent Office]. Owing to the recent date of this invention, very little can be said of it, except that one of these guns has been used very successfully in the Arctic regions, and that others are being manufactured for the same fishery.

The early Dutch whalemen also used a gun with a flint lock and bell-shaped muzzle, a kind of blunderbuss, which was mounted on a swivel, notwithstanding it was provided with a wooden stock similar to that of the shoulder-gun. The first English guns were also provided with flint locks.

THE ROCKET-GUN.—The rocket-gun is of recent invention; it is supported by an iron standard, and fired while resting on, and not against, the shoulder of the gunner. It throws a large rocket and explosive lance weighing eighteen or twenty pounds, which acts in the capacity of a harpoon and bomb, and is used mainly in coast whaling or on soundings.

The rocket-gun was patented January 22, 1861, by Thomas W. Roys, of Southampton, New York, from which the California whaling-rocket is an outgrowth. Mr. C. D. Voy, of California, tells me that it was used, as far as the apparatus was concerned, very successfully on the steamer "Daisy Whitelaw," and also on the "Rocket" off the California Heads; but owing to the scarcity of whales (finbacks) in that locality, the enterprise was a failure. Mr. ——— Wilson, of Sitka, Alaska, tells me that it is also used successfully, from the deck of a small steamer, by the Northwest Whaling Company in the capture of finbacks and humpbacks on the southern coast of Alaska.

GUN-HARPOONS.—The harpoons intended to be projected from guns, technically known as "gun-irons," may be used in connection with the shoulder-guns or with the swivel-guns. The shoulder-gun irons are seldom used, as the weight of the whale-line has a tendency to deflect the instrument from a true course of flight. The swivel-gun irons are employed on soundings, the heavy charge of the gun at short range overcoming the difficulty just mentioned.

Harpoons of this class may be made with double shanks joined at either end with adjustable loops composed of several wires so deftly intertwined as to conceal the ends, or of rope into which one end of the iron strap (rope) is made fast; they may be made with single shanks

and sliding iron collars with rigid eyes, into which the iron straps are made fast, which, as is the case with the loops when the irons are placed in the barrel of the guns, remain on the outside; or they may be made with fluted shanks and the iron strap folded in the grooves and placed in the barrel with the instrument, the ends of the straps, to which the whale line is made fast, hanging from the muzzle.

From the following account of this kind of instrument contained in Falconer's Marine Dictionary (1830) it appears that the English at that date used a *chain strap* instead of rope for *making fast* the whale line. "Gun harpoon (*harpoon qui se darde dans un mousqueton*, Fr.), a weapon used for the same purpose as above [the Harpoon, Harping-iron, Harpon, *à pêcher les baleines*], but is fired out of a gun instead of being thrown by hand. It is made of steel and has a chain attached to it, to which the line is fastened."

The shoulder-gun irons are lighter and usually shorter than those intended for the swivel gun, and are almost always made with a movable barb or toggle; those intended for the swivel gun, though the "toggle" is the prevailing style, are sometimes manufactured with fixed double-barbed heads.

WHALEMAN'S LANCES.

The lances used in the whale fishery may be divided into two classes: (1) the non-explosive and (2) the explosive.

Of the first class there are several types, including those which may be used as hand instruments or as projectiles from guns; and of the second class many styles have been introduced which were designed to be used exclusively with guns. For convenience' sake, and in order that a more intelligent classification may be made, and a less complicated system adopted, the whale lances will be provisionally grouped as follows: (1) The non-explosive hand-lance, (2) the explosive hand-lance, (3) the non-explosive gun-lance, and (4) the explosive gun-lance or bomb.

HAND-LANCES.

THE NON-EXPLOSIVE HAND-LANCE.—The hand-lance with non-explosive head was the primitive instrument adopted by civilized races for killing whales after they had been *fastened to* with the harpoon and line. The shanks of these instruments are manufactured from the best Swedish iron, and, including the heads, vary in length from five and a half to six feet. The heads, cast-steel, are about three inches long and two inches wide, spoon-shaped, convex on both sides, and in some instances have grooves or longitudinal furrows which were probably designed, after the manner of some of the Indian arrows, to permit the egress of blood in order that it might flow freely from the wound and weaken the victim. The heads of the hand-lances have four cutting edges, and are, of course, barbless, as it is intended that the instrument

should cut its way both in and out of the flesh. This instrument, which has been superseded by the bomb-lance, was always manipulated by the officer of the boat. The bow oarsman, by means of the main warp as well as by main strength, hauled the boat alongside the running whale, and the officer thrust the lance into the region of the heart and lungs, called the "life," of the cetacean, and by up and down motions, known as "churning," inflicted the mortal wound.

Notwithstanding that the explosive lance has practically done away with the use of the hand-lance, three of these instruments are at present always included in the outfit of a whale-boat, to be used in cases of emergency.

In this class should be mentioned the "fluke-lance" (56358), an illegitimate offspring of the thick boat-spade and the hand-lance, which was devised to take the place of the former during the dangerous process of "spading flukes," for stopping a running whale, in order that the boat may be hauled alongside the animal and an opportunity afforded for killing it with the hand-lance. I have been able to obtain only one example of the fluke-spade, which owes its origin to the fancy of a whaleman, and is regarded as a monstrosity by all the fraternity.

The seal lances, which may also be employed in killing the sea-elephant and walrus, but never used in whaling, on account of the short shanks, should also be grouped under this head. Such instruments have heads of varying sizes, and the ordinary shanks which terminate at the rear in sockets for the poles. They are thrust by hand, and are employed at present.

Friderich Martens, in his account of a whaling voyage to Spitzbergen, in 1671, describes as follows the method adopted by the early Dutch whalemen for the capture of the sea-horse, or sea-morse: "When great multitudes of them lie upon a sheet of ice, and they do awake and fling themselves into the sea, you must keep off your boat at a distance from the ice until the greater part of them are got off; for else they would jump into the boat to you and overset it, whereof many instances have been; then the harpoonier runs after them on the ice, or he darts his harpoon out of the boat at the sea-horse, who runs on a little until he is tired; then the men draw on the rope or line again and fetch him to the boat, where he begins to resist to the utmost, biting and jumping out of the water, and the harpoonier runs his launce into him until he is killed."*

THE HAND-LANCE WITH EXPLOSIVE HEAD.—The hand-lance with a non-explosive head remained for nearly two centuries the solitary type of this kind of whaling apparatus, technically known to the whalemen as "craft." On March 26, 1878, Daniel Kelleher, of New Bedford, Massachusetts, received letters-patent for an instrument, to be used as a hand-lance, which, being operated by a mechanical device coming in contact with the blackskin of the whale, should automatically explode the mag-

* Hakluyt Society, vol. 18, p. 89.

azine and imbed the fragments in the most vulnerable parts of the internal structure of the animal.

BOMB-HARPOONS.—The bomb-harpoons, or harpoons with explosive heads, also known as "harpoon-guns," of which there are two examples in this series (42762 and 56370), have detachable lance-like heads, which are chambered to receive the charge of powder, and the ordinary harpoon shank and socket. When used they are attached to poles, and thrust by hand, serving the double purpose of "fastening on to" and killing or seriously wounding the whale. Although these instruments are undoubtedly very effective, they are not regarded with much favor by the whalemen, who aver that they "are afraid of them."

One of the Provincetown schooners, when on a whaling voyage, "doubled the cape" with a box of bomb-harpoons stowed in her run; but the box was never unpacked—as the captain was unwilling to run the risk of lowering his boats with its contents—until some time after the return of the vessel to her home port, when I found the box in an old loft, and sent one of the instruments (56,370) to the National Museum. Upon its arrival the head was "soaked" in kerosene and the powder removed.

Owing to the prejudices of whalemen, these instruments have never been fairly tested, and few of the whalemen know anything of them by practical experience.

GUN-LANCES.

The lances, which are discharged from the different kinds of guns, and used with better effect and at a safer distance from the whales than were the hand-lances, are explosive and non-explosive; the former are by far the most effective, and are universally used in preference to the latter, which, although they were the results of American genius exerted in revolutionizing the system of whaling, are seldom met with in the American fishery, though worthy of mention in this class.

THE NON-EXPLOSIVE GUN-LANCE.—Subsequent to the introduction of the whaling-gun, various efforts were made to perfect a projectile for killing whales. The result was the non-explosive lance and the bomb-lance. The former has never been successfully employed. Among the most prominent of this type is the one made by Captain Josiah Ghenn, of Provincetown, Massachusetts, which was used principally for "waifing" dead whales; the one made and patented by Robert Brown, of New London, Connecticut, and several other patents of which very little is known. This kind of instrument has been supplanted by the bomb-lance.

EXPLOSIVE GUN-LANCES.—Of the explosive gun-lances there are properly four types: (1) The primitive bomb-lance for killing whales, and its modified successors, of which latter there are many kinds and which shall be designated here as *bomb-lances* to distinguish them from the following; (2) the rocket-bomb, which was invented expressly for the

rocket-gun, and pre-eminently the most deadly missile that has ever been constructed for the capture of the whale; (3) the darting-bomb; and (4) the bomb-lance harpoon.

The Bomb-Lance.—The first bomb-lance patented in the United States for killing whales was invented by Oliver Allen, of Norwich, Connecticut, and is recorded in the United States Patent Office (No. 4764), under date of September 19, 1846. This instrument, unlike those which have been subsequently devised, was constructed without guiding-wings, and with an unnecessarily long tubular shank or shaft, in which was inclosed the fuse that penetrated the magazine near the anterior end of the instrument. Mr. C. C. Brand, of Norwich, Connecticut, made improvements in the Allen lance, and was, in his day, the most successful and energetic agent in developing and introducing this new mode of capturing the whale. At the death of Mr. Brand, his son, Mr. Junius A. Brand, to whom the genius of the father was transmitted, perfected the Brand lances, which are now used by all classes of whalemen. In the mean time numerous devices were constructed and patented, many of which live only in name. The evolution of this kind of lance has resulted in the "Brand," the "Pierce," and the "Cunningham & Cogan" lances, which, standing upon their special merits, are the standard lances of the age, and are to be met with in all parts of the globe where the whale fishery is prosecuted.

Although the systems of manufacturing the present lances are for the most part based upon patents recently issued, yet the inventions date back, respectively, as follows: C. C. Brand, June 22, 1852; Eben Pierce, June 1, 1869; Cunningham & Cogan, December 28, 1875, and Junius A. Brand, November 25, 1879. The term "new model," employed in the individual references to the Brand lances, is applied to those constructed at present under the patents of Junius A. Brand to distinguish them from the "old models" formerly made under the C. C. Brand system.

The magazines, or shells, of the Brand lances are cast iron, annealed, cast with heads or points which have three cutting edges, and resemble in appearance an "engraver's scraper." This lance is exploded by a time-fuse ignited by the detonation of a primer, to which fire is communicated by a firing-pin; the latter being operated upon by the discharge of the gun. The wings are of vulcanized rubber.

The shell or chamber of the Pierce lance is composed of seamless brass-tubing; the instrument has metal wings; the internal operative mechanism for exploding the lance is placed in or near the anterior end, and the explosion is caused by the concussion of the discharge of the gun, which ignites a time-fuse by means of a percussion cap.

The Cunningham & Cogan lance is composed of iron piping, to which is affixed (screwed) a malleable cast-iron point with three cutting edges. The instrument has rubber wings, and is exploded by a time-

fuse ignited by a central-fire cartridge rigidly fixed to the lance and forming a part of it.

The above patents differ in their internal construction and arrangement; and, with the exception of the Brand No. 4, which is especially designed for Greener's swivel-gun, they may be used in connection with the shoulder-guns.

The Allen lance prevented the egress of water by the issue of flame in its rear caused by the burning of the fuse; the present lances are rendered impervious to water, either by tight screw-joints or by being hermetically sealed.

Pierce's and Cunningham's lances weigh, each, one and a quarter pounds, and the Brand No. 2 (new model, for example) two pounds. These weights do not include the amount of powder required for the charges.

The Rocket-Bomb.—The bomb which was designed especially for the Roys' gun, is propelled by a rocket affixed to its rear, and is the sole representative of its kind, so far as the American fishery is concerned. Further reference will be subsequently made to this projectile.

The Darting-Bomb.—The darting-bombs are short, wingless lances, made for the darting-guns, patented and manufactured by Captain Eben Pierce, Patrick Cunningham, and Mr. Junius A. Brand, respectively, and known as the "Pierce darting-bomb," "Brand darting-bomb," and the "Cunningham darting-bomb."

Bomb-Lance Harpoon.—Projectiles discharged from guns consisting of a bomb and harpoon combined have met with little success. Such instruments are intended to fasten to a whale and at the same time kill or disable it. Owing to the weight of a combination of this nature, which is unavoidable in its peculiar construction, it cannot be used in connection with shoulder-guns, as it would be impossible for man to withstand the shock of the recoil. In addition to this, the weight or "drag" of the whale-line, which must of necessity be attached, deflects the projectile from its true course, and it consequently fails to strike the whale. A harpoon of this nature, however, has recently been introduced which bids fair to overcome the obstacles just mentioned. This instrument is intended to be fired from an improved swivel-gun, and was designed by H. W. Mason and Patrick Cunningham, of New Bedford, Massachusetts, and is mentioned in the specification forming part of letters-patent (269080, United States Patent Office) dated December 12, 1882. An example of this projectile (United States National Museum, No. 56366) is included in this exhibit, and the success of the contrivance will, undoubtedly, in a short time be made known through its introduction into the fishery of the Arctic regions.

4.—IMPLEMENTS USED EXCLUSIVELY ON THE VESSEL.

The various implements employed in *cutting-in* the whale, and in mincing and boiling the blubber, are grouped upon and about a pyramidal

frame-work of wood, from the center of which the immense blubber tackle lashed to mast-head shackles is suspended. The necessary chains and toggles for *fluking* the whale and for hoisting in the blubber, head, case, etc., are placed about the front. A forward cutting stage is suspended at the right, upon which a lay figure, life size, of the second mate stands with a wide cutting-spade in its hands in the act of *scarfing* the blubber. A semicircular rack in the rear contains full-sized cutting-spades of all kinds, including the heavy head-spades and the throat-spade. The case-bucket, boarding-knives, hand and machine knives for mincing blubber are displayed at the ends. The blubber-gaffs, pikes, and forks are arranged in a small rack in front, upon the left. These, together with the bailers and scrap-dippers which are in the rear, where length of space may be obtained, constitute a fair representation of the implements employed when *boiling-out*. About the top of this immense structure of whaling apparatus, which is strongly suggestive of the odor peculiar to a whaling vessel, the boat-waifs for locating dead whales are placed in prominent positions. Slabs of whalebone cross each other near the top. The superstructure consists of a main royal pole to which lookout bows are shackled. An American ensign, saturated in oil, carried by the schooner "Abbie Bradford" twelve years in the Hudson Bay whale-fishery, floats from the pole, and at the lookout a petty officer stands with a marine glass at his eye, sweeping the horizon for whales. This display contains sixty-eight objects.

CHAINS.

The chains used when working about a dead whale are the "fluke-chain," the "fin-chain," and the "head-chain." These large heavy chains are employed in the order stated: (1) for fastening the whale to the ship; (2) for raising the first "piece" of blubber with either the larboard or starboard fin, according to the side on which the whale is lying, and (3) for hoisting in the head. These chains have large triangular loose links at one end, fitting the broad thread of the blubber-hook, to prevent the strain from bursting the links, or, as they are commonly called, the "rings," although they have the form of an isosceles triangle.

THE FLUKE-CHAIN.—A large rope, known as the fluke-rope, was formerly used for *fluking* a whale, and is used now, to a limited extent; but, on the majority of the whaling vessels the chain is preferred. The process of fluking a whale, especially in rugged weather, or at night, is often accompanied by vexatious annoyances and delays. One end of the chain, with the large link, is passed around the small of the whale by means of a large buoy and rope, or by an instrument recently introduced, known as the "fluker" (55817); the other end, with the smaller link, is rove through the large link, which is slacked to the whale; the free end is taken inboard, and when the chain has been hauled taut,

it is made fast to a bitt in the deck. The chain may be veered out or hauled taut as the circumstances attendant upon the cutting may require.

THE FIN-CHAIN.—The fin-chain and fluke-chain are similar in appearance, but differ in length and weight, and in the fact that the fin-chain has a large link near the middle which is used, as it is termed, for "shortening up," in order that a "longer heave" may be obtained before "coming two blocks." The fin-chain may be made without the middle loose link or ring; but those with such a ring are to be preferred. The whale having been *fluked*, the process of cutting is initiated by passing the end of the chain with the small ring around the fin, by means of a rope which is made fast to the ring. The rope and chain are then rove through the large ring, which is slacked to the fin. The blubber-hook is attached either to the middle ring or end ring; the officer cuts through the blubber around the fin, and across the whale abaft the head. The men *heave* away on the windlass, and both blubber and fin are hoisted "two blocks."

THE HEAD-CHAIN.—The head-chain, or "head-strap," as it is more frequently called, is an endless chain, with smaller links than those of the two preceding chains. It is used in right-whaling and bowheading for hoisting in the "head" (upper portion of the head) and baleen; in sperm-whaling, for hoisting in the "head," which is, in this instance, that portion consisting of the "case" and the "junk." If the whale is small, the entire "head" (junk and case) may be hoisted in; if large, these parts are taken separately. Hence, we have the apparently conflicting terms which are indiscriminately applied to this chain, namely, the "head-strap," the "case-strap," and the "junk-strap," as well as "head chain."

WHALEMAN'S SPADES.

Instruments of this character denominated "spades" by whalemen have nothing in common with the agricultural implement of the same name. In making a comparison, they may be said to resemble more nearly the common chisels used by carpenters, both in appearance, so far as the heads or blades are concerned, and in the manner in which they are used. These implements preserve their identity with remarkable accuracy. The narrow spade for "scarfing" has the same characteristics on all whaling vessels, and the same may be said of the other spades.

Of this class, used at the present time by all whaling vessels, there are (1) the "cutting-in spades," which include the "head-spade," the "throat-spade," and properly the "deck-spade;" (2) the "blubber-room spade;" (3) the "pot-spade," and (4) the "boat-spade," which, though mentioned last, was at one time an instrument of the greatest importance in capturing a whale.

The heads of these spades are made at some of the whaling ports—

principally at New Bedford—by blacksmiths who are engaged almost wholly in the manufacture of such "craft," including harpoons, hand-lances, etc. The best cast steel is used for the heads, and wrought iron for the sockets and shanks. About thirty cutting-spades without poles are included in the outfit of a whaling vessel. The poles, which are made of spruce, from fifteen to twenty feet long, are "rigged" at sea.

CUTTING-IN SPADES.—The cutting-in spades include the narrow spade for "scarfing," which is a term for cutting the blubber into spiral strips as it is unwound, or peeled, from the body of the whale; the wide cutting-spade for "leaning," severing the small pieces of flesh and muscles which adhere to the blubber; the head-spade for cutting the bone in decapitating a whale; the "sliver-spade" for detaching the pieces of flesh and blubber which connect the head and body when cutting off the head; the "throat-spade" for making a passage through the blubber of the head for the *head-strap*, and for taking out the baleen which remains in the throats of the right-whales; and the "deck-spade" for reducing to small sections the large blanket-pieces which may possibly, during the process of boarding, have to be temporarily placed on deck, before they can be lowered down the main hatch.

The above spades are used by the officers, sometimes the captain, but usually the mate and the second mate, who stand upon stages *slung* over the side of the vessel.

THE BLUBBER-ROOM SPADE.—The blubber-room spade, with a wide blade and short handle, is used between decks for the reduction of the large blanket-pieces to smaller sections, known as "horse-pieces," which are pitched upon deck, minced, and thrown into the try-works.

THE POT-SPADE.—The pot-spade is similar to the deck-spade, with the exception of the handle, which must, of necessity, be longer, as this instrument is used about the seething cauldrons of oil, for *spading* the pots to prevent the scrap from burning on the sides and bottoms and discoloring the oil.

THE BOAT-SPADE.—The boat-spade is a small, thick-set, gigantic chisel, with chamfered edges and sides, and always included in the outfit of a whale-boat, though seldom used by modern whalemen. It was mainly relied upon by the early whale-fishermen for "stopping a running whale," a process commonly known as "spading flukes." For this purpose the boat was propelled to the junction of the caudal-fin and the body—the "small" of the whale—and the animal disabled by disconnecting the cords, or by *spading* a large vein which underlies the "small"; a feat which required considerable skill and bravery, and was the most dangerous in the fishery. The introduction of the bomb-lances, however, has done away with this performance, and the whales are "stopped" as effectually at a greater distance. This spade is always carried in the boat, and used for making holes in the lips of the whale for reeving the tow-rope.

ROPES USED BY WHALEMEN.

It is not intended that the ropes exhibited in this series should include the cordage employed in the rigging of a vessel, but simply those which are used in "working about a whale," dead or alive, such as the whale-line and lance-warps used during the capture; the fluke-rope, cutting-falls, and guys, used while stripping off and hoisting in the blubber; and bone-yarn, for tying up bundles of baleen.

Whale-lines are manufactured from the best grades of Manila, loose laid, pliable, capable of bearing immense strains, and free from tar. The raw material is sprinkled with right-whale oil, during the process of dressing, to prevent the lines from rotting when exposed to salt water.

WHALEMAN'S HOOKS.

Hooks employed in the whale-fishery may be used for handling lines, chains, and blubber.

The line-hook may be used from the vessel for catching stray lines or any object afloat, but chiefly when the boat comes alongside the vessel with a dead whale, for hauling on board one end of the tow-rope, in order that the whale may be "fluked."

The large boat-hook is used from the stage, when "cutting-in," for detaching pieces of whale-line fastened to the harpoons which have been thrown into the whale during the capture, &c.

The common boat-hook is used in the whale-boat, as is any other hook of this character.

The large ring boat-hook belongs to the "cutting-gear" of the vessel, and is used from the stage, when cutting-in, for pressing upon the *back* of the blubber-hook and directing the point into the hole made in the blubber; for adjusting the fin-chain, and for hauling large pieces of blubber about deck.

The blubber-hook proper is the large hook, weighing from seventy-five to one hundred and fifty pounds, attached to the blubber-tackle and used in hoisting in the blubber.

The fin-chain hook and the small blubber-hook, or lip-hook, will be fully discussed in the subsequent individual references.

BLUBBER-TOGGLES.

The "throat-chain toggle," formerly used for taking in the throat, is essentially a *toggle*, notwithstanding the hermaphroditic sense in which the term is used. It consists of an iron toggle about eighteen inches or two feet long, and with a diameter of about three inches, with an iron strap welded around its center, forming a rigid eye, into which the "tail" or chain is made fast, and a stiff eye at one end which is used for binding or *thrap-lashing* the apparatus when toggled in the blubber. The free end of the chain has the regulation triangular link.

The common blubber-toggle is made of hard wood, and is about two feet long and six or eight inches in diameter. The wooden toggles have been used for many years for *boarding* the blubber, and are still preferred, since such an implement cannot be broken as readily as an iron toggle, especially when affected by the action of the frost. This kind of toggle, or "blubber-fid," is used in connection with the cutting-tackle, when the lower block is strapped with rope, and is, in appearance, ungainly and insignificant, but withal an important agent in the whale-fishery. A hole having been cut or *mortised* in the blubber near the fin, the eye of the block-strap (the *purchase-strop* of the English—*Admiral Smyth*) is pushed through and toggled with the fid, and the blubber hoisted in, the toggle being alternately shifted as the sections of blubber are cut from the main-piece, and lowered down the main-hatch.

WHALEMAN'S KNIVES.

It is the intention to discuss here only the knives used in connection with the blubber, which, comprehensively, may be termed *blubber-knives*. Of these the "boarding-knife," the "leaning-knife," and the "mincing-knife" are the most prominent, and are used in the order named when manipulating the blubber. Next in importance are the sheath-knives worn by the foremast hands at all times, and by the officers when *down for whales*, and the boat-knives. The former are so well known as not to require special mention here; the latter are always carried in the boats to be used in cutting the whale-line provided it "nulls" when fast to a whale, and for other purposes.

THE BOARDING-KNIFE.—Whalemen, as well as blacksmiths ashore who manufacture whale "*craft*," pick up and preserve all kinds of knives, especially those with long blades, that may be utilized either ashore or afloat in making boarding-knives. The cavalry saber and the navy cutlass are especially well adapted for the blades of this kind of knife, and are frequently used for the purpose. The whalemen visiting foreign ports also obtain by "trade," or otherwise, various kinds of knives, some of which are comparatively little known in this country. Some of them are brought home as curiosities, but others as material for the blades of boarding-knives, or for the construction of other instruments. They are, however, rarely seen in the interior, as they may be "shipped" on another voyage either in the fore-hold or in the run of the vessel, or as blades of boarding-knives; they may be consigned to the lofts where all kinds of cutting-gear are stowed, and remain for ages, or they may be lost in the mighty current which sweeps through the junk-shops, carrying with it thousands of tons of worthless material, as well as some valuable and interesting specimens which should be preserved. The "macheta" knife, so well known in tropical South America, which the natives use with such remarkable dexterity both in felling trees and in *carving* one another, frequently finds its way to the whaling-ports of this country. This kind of knife, an example of

which is included in this series, is known to the Provincetown whalemen as the "cane-knife," and is used, I am told, by natives of the West Indies for cutting sugar-cane; but it is not so well adapted for the manufacture of boarding-knives as are the saber and cutlass, and is simply mentioned as a specimen of the knives sometimes found on whaling-vessels.

The boarding-knife is used by one of the officers of the vessel, usually the third mate, during the process of "boarding" the blubber, for cutting the holes, by making longitudinal thrusts through the immense blanket-piece, into which the blubber-tackle is made fast. This having been accomplished, the blanket-piece is unwound from the whale until its upper end or "head" is hoisted to the main-top, or "two blocks." The officer with his formidable-looking boarding-knife cuts off, near the plankshear, a section of the blubber, about 14 feet long, 6 feet wide, and as thick as nature has made it. This section is lowered into the blubber-room, where it is stowed away, and subsequently "leaned."

LEANING-KNIFE.—The leaning-knife resembles the ordinary butchers' knife of medium size, or the common kitchen knife, and is used in the blubber-room for "leaning blubber," that is, detaching small pieces of flesh or muscles which cling to the fat when cut from the whale, and which otherwise would *blacken* the oil when *boiled-out.*

MINCING-KNIVES.—The mincing-knives may be used, as it is termed, "by hand," or in connection with a machine designed expressly for mincing or slicing the blubber. Although these knives are used for the same purpose, yet they differ in form, and will be treated separately.

Hand Mincing-Knife.—Mincing by hand was the first method adopted and is largely in use at the present time, notwithstanding labor-saving machines have been constructed for the purpose. Hand mincing is extremely laborious, but some of the whalemen prefer this way of preparing the blubber for the try-pots, claiming that the horse-pieces are minced more uniformly, and that the oil, in consequence, is more freely boiled out. The horse-pieces are laid upon a rudely constructed bench called the "mincing-horse," and cut into slices varying from one-fourth to three-fourths of an inch thick. These slices are called "bibles" or "books"; they are not detached at the base of the piece, but are held together as are the leaves of a book, and resemble an enormous piece of fat pork. In this condition they are pitched into the try-pot.

The Mincing-Machine Knives.—This sort of knife, without handles, is rigidly fastened to a frame on the machine, and is automatically manipulated by the revolutions of a crank. The shapes of such knives vary, depending upon the kind of machine for which they are especially designed. The work of mincing is more rapidly accomplished with the machine than with the hand-knife. It is not always practicable to use the machine, owing to the yielding nature of the blubber of some species of whales, and therefore the hand-mincing knives are always carried, though the machine is included in the outfit.

5.—GLASS CASES CONTAINING CURIOSITIES AND SCRIMSHAW WORK, PAPERS AND LOGS, WHALE-LINE, AND ACCESSORIES.

These cases contain the "pans" (posterior portions of the jaw-bone of the sperm-whale, *Physeter macrocephalus*), the teeth of the same species, and tusks of walrus, engraved and carved in an artistic manner by the whalemen, as well as sundry articles manufactured from ivory and bone. Other cases are devoted to a class of objects known as "curios," brought home by whalemen from different parts of the world, including implements made and used by Eskimos of Hudson Bay, from the islands of the South Pacific, and elsewhere. This series also includes lines and ropes manufactured by the New Bedford Cordage Company, journals of voyages, copies of papers carried by the bark "Gosnold," of New Bedford, and other objects of minor importance.

6.—PHOTOGRAPHS.

A series of photographs has been made at New Bedford of whaling-vessels, docks, buildings, and whalemen. The American whaleman is represented by a group composed of both active and retired whaling-masters.* Other groups illustrative of the foreign element employed in this fishery, consist of Kanakas, Portuguese of Cape Verde, negroes from an island on the coast of Africa, and from Virginia (the latter an immense man over six feet three inches tall), Chilmark Indians from Gay Head, Massachusetts, West Indiamen, and a group of Hudson Bay whalemen attired in their fur clothing. There are also photographs of the residences of retired whaling captains, including the houses of Captain H. W. Seabury, of New Bedford, and Captain James V. Cox, of Fairhaven, and photographs of the Mariners' Home, a charitable institution where unfortunate whalemen are entertained temporarily, and the Seamen's Bethel, a place of worship erected especially for whalemen. These photographs have been enlarged by electric light, and mounted on frames thirty by forty inches.

The Species of Whales from a Commercial Standpoint.

In the ninth century, when Ohthere made his famous voyage in the Northern seas—the first record we have of killing the whale—it is believed that his captures consisted of the smaller species of cetaceans, probably of the family *Delphinidæ*, though we have no positive knowledge of the fact.

Markham† states that the Basque fishermen captured a baleen whale

*Group of whaling-masters of New Bedford, photographed September 14, 1882. Isaiah West, ship "Florida;" H. W. Seabury, ship "Coral;" L. Braley, schooner "William Wilson;" M. W. Taber, ship "Trident;" J. H. Cornell, ship "Janus;" Amos C. Baker, bark "A. R. Tucker;" James V. Cox, bark "Draco;" and James A. Crowell, bark "Arnolda."

†Clements R. Markham, C. B., F. R. S., paper read at the Zoological Society December 13. Published in Nature. Littell's Living Age, No. 1972, April 18, 1882.

(*Balæna biscayensis*) which had frequented their coast from time immemorial; but that this species had become nearly extinct in the seventeenth century, and that the last capture made by the Basque fishermen was on February 11, 1878, when a whale appeared off the coast between Guetaria and Zarauz. In the early part of the seventeenth century the English, Dutch, and several other contemporary European nations devoted their attention to the "whale," or Greenland whale, known to the scientific men of that age as *Balæna mysticetus*, a species of great commercial value on account of its oil and baleen. These early whalemen also made occasional captures of the sea-horse, or morse (the common walrus, *Rosmarus obesus* (Illig.), Gill, and rarely of the *Beluga*. Nantucket, at one time the leading whaling port of the world, paid exclusive attention to the capture of the sperm whale (*Physeter macrocephalus*), whose habitat is in the warmer seas; and shortly afterwards England sent vessels to engage in this fishery. "The sperm whale or nothing," seems to have been the motto of Nantucket, as none of her vessels would lower their boats for the right whale until it was too late to rectify her error. New Bedford also inaugurated her fishery on the same plan of operation, but since the decrease in value of sperm oil her vessels have willingly captured the two species of the right whale (*Eubalæna cullamach* (Chamisso) Cope, of the Pacific, and *Eubalæna cisarctica*, Cope, of the Atlantic), and the bowhead whale (*Balæna mysticetus*, Linn.), as well as humpbacks and gray whales, of which further mention will be made. The sulphur-bottom whales (*Sibbaldius sulfureus* and *S. borealis*) are seldom captured, owing to their remarkable shyness and swiftness. The California gray whale (*Rhachianectes glaucus*), ranging from the Arctic seas to Lower California, is captured by vessels at sea, by whalemen who establish stations on the California coast, as well as by the the Indians of Cape Flattery. The humpback whales (*Megaptera versabilis*, Cope, and *M. Osphyia*, Cope), frequent all oceans and are also captured. One species of this family (*Osphyia*), occasionally appears on the Cape Cod coast, following the herring inshore, and other small fish upon which it largely feeds. The finback whale of the Pacific (*Balænoptera velifera*, Cope), like the sulphur-bottom, is remarkable for its swiftness, and is therefore difficult of capture. The two Atlantic finbacks (*Sibbaldius tectirostris* Cope, and *S. tuberosis*, Cope), frequent the Cape Cod coast at certain seasons, and are captured by shore whalemen.

As is well known, *Physeter macrocephalus*, aside from the oil found in its blubber, furnishes the spermaceti, which at one time yielded handsome financial profits. But at present the demand for this product is limited, spermaceti having been supplanted by cheaper and better substitutes. This species also affords ivory and the valuable ambergris.

The right whales, so called, are now the principal objects of pursuit. Besides their oil they yield the whalebone of commerce, which, notwithstanding the numerous substitutes that have been introduced into

the market, always meets with a ready sale at remunerative prices. Of the bone-bearing whales the most profitable are the *B. mysticetus*, *E. cullamach*, and *E. cisarctica*. The former also yields a fine grade of oil, known commercially as "bowhead oil" or "arctic oil." The other species, consisting of the humpback and California grays, and finbacks, yield "short bone," which is not of so much commercial importance.

The principal grades of bone are known in market as "arctic," "northwest," "South Sea," "humpback," and "calf." The smaller pieces, which are bundled separately, are known as "cullins." According to the New Bedford Shipping List, February 6, 1883, the importation of bone from January 1 of the present year to February 5, inclusive, amounted to 138,200 pounds, against 18,700 pounds during the same length of time in 1882.

Blackfish (*Globiocephalus* sp.) are also captured for their oil, and rarely the sperm-whale porpoise (*Hyperoödon bidens*) or the "square-headed grampus" of the whalemen. The latter yields a fine grade of oil, but, owing to the difficulties attendant upon its capture, whalemen seldom encounter it. The former are taken at sea, and at times on the coast of Cape Cod. The white whale (*Delphinapterus catodon* (Linn.) Gill) is occasionally captured in the rivers flowing into Cumberland Inlet, by the New London and New Bedford whalemen.

As to the present condition and statistics of the whale fishery, I submit herewith the following paper, prepared by Mr. A. Howard Clark, Assistant, United States National Museum.

STATISTICS OF THE WHALE FISHERY.

By A. Howard Clark.

The American whale fishery is now of small importance when compared with its greatly prosperous condition of thirty or forty years ago. There is still, however, a considerable number of vessels scattered over the whaling grounds in different parts of the world, and enough energy manifested in the pursuit of whales to make the business profitable in spite of the drawbacks with which it has to contend.

Three-fourths of the fleet is owned at New Bedford, which is the headquarters of the fishery. Other places, as Provincetown, Boston, and New London, in New England, and San Francisco on the Pacific coast, have an interest in the business and meet with fair success.

The entire fleet in 1880 numbered 171 vessels, aggregating 38,637.88 tons, valued, with outfits, at $2,857,650. In this fleet there were 119 bark-rigged vessels, 7 ships, 9 brigs, and 46 schooners. Two of the barks were fitted with propellers. The largest vessel of the fleet was the steam-bark Belvidere, measuring 440.12 tons, and the smallest vessel employed in ocean whaling was the schooner Union, 66.22 tons. Most of the schooners and the smaller vessels of the other classes were employed in the Atlantic Ocean whaling, while the largest and best equipped vessels were in the Pacific and Arctic fleets. The men required for these vessels numbered 4,198, and were of many nationalities, from the native American to the natives of the Sandwich or South Pacific Islands. A large proportion of the whalemen were Azorean and Cape de Verde Portuguese. The distribution of the fleet in 1880 was as follows: Hudson Bay, 5 vessels; North and South Atlantic grounds, 111 vessels; Bering Strait, 25 vessels; Pacific Ocean, 22 vessels; in port throughout the year, 8 vessels. The ownership of the vessels was divided between the different ports as follows: Ports in Massachusetts: Boston, 6 vessels; Provincetown, 20; Marion, 2; New Bedford, 123; Dartmouth, 1; Westport 2, and Edgartown, 7. In Connecticut there were 5 vessels, hailing from New London, and in San Francisco, California, 5 vessels. The interest of San Francisco in this fishery cannot, however, be measured by the number of vessels owned there, for almost the entire Arctic fleet and vessels cruising in the North Pacific are accustomed to make San Francisco a fitting-port and the headquarters for the reshipment of oil and bone to the Atlantic coast.

The value of the products of the whaling industry in 1880 was $2,636,322; the yield included 37,614 barrels of sperm oil and 34,626 barrels of whale oil, valued at $1,723,808; 458,400 pounds of whalebone, worth $907,049; and $5,465 worth of ambergris and walrus ivory. The

Pacific Arctic Ocean grounds were the most productive, yielding oil and bone worth $1,249,990. From the Atlantic Ocean grounds oil and bone were taken worth $908,771.

Most of the vessels owned at Provincetown were of the smaller class and employed exclusively in cruising in the Atlantic Ocean. The Hudson Bay and Davis Strait grounds have always been favorite resorts for the New London fleet. New Bedford vessels are found in almost all seas, with the exception of the Indian Ocean, which has been abandoned by American whalers.

Besides the vessel fishery there is a boat or shore-whaling industry, which at times is quite profitable. The only points on the Atlantic coast where boat-whaling is carried on are at Provincetown, on Cape Cod, and, one or two points in North Carolina. On the coast of California there are several stations, manned mostly by Portuguese, and on the coasts of Washington Territory and Alaska whales are taken by the Indians and Eskimo. The principal species on the Atlantic coast is the finback whale, and on the Pacific coast the California gray whale. Neither of these whales yields bone of much value, and both furnish but a limited quantity of oil. Humpback, sulphur bottom, and right whales are occasionally taken along the California and Alaskan coasts, but seldom on the Atlantic.

The whale fishery of this country was in its zenith of prosperity about the middle of the present century, when the fleet numbered 736 vessels, aggregating 231,406 tons. From 1854 to the present time there has been an almost constant decrease in the size of the fleet. The chief cause of this decline has been the introduction of mineral and cotton-seed oils, at very low prices, which made a great reduction in the value of whale oils, and has rendered the cost of production equal to if not greater than the market value of those articles. The products of the whale fishery in 1854 were of greater value than for any year before or since, being $10,766,521, against $2,056,069 in 1879, which was the lowest value since 1828, when the fishery yielded $1,995,181. The largest quantity of sperm oil was in the year 1837, when the fleet landed 5,329,138 gallons, worth $6,650,000. The largest quantity of whale oil was in 1851, when there were landed 10,347,214 gallons, worth $4,656,000. In 1853 the amount of whalebone taken was 5,652,300 pounds, worth $1,917,000; the largest amount in any year of the history of the business. The value of bone has, however, greatly increased since that period, and is now more than of $2 per pound.

The relative importance of the various whaling grounds during the past years, from 1870 to 1880, is shown by the following facts. Of the sperm-oil landed during that period, 55 per cent. was taken in the North and South Atlantic Oceans, 33 per cent. in the Pacific, and 12 per cent. in the Indian Ocean. Of whale-oil, 58 per cent. came from the North Pacific and the Pacific fleets, 24 per cent. from the North and South Atlantic fleets, 10 per cent. from the South Pacific, 5 per cent. from the

Indian Ocean, and 3 per cent. from Hudson Bay, Cumberland Inlet, and Davis Strait. Of the whalebone secured in the same decade, 88 per cent. was from north of the fiftieth parallel in the North Pacific and Arctic Oceans, and 5 per cent. from Hudson Bay and Cumberland Inlet, and the balance from the Atlantic, Indian, and other oceans.

The number of voyages undertaken by the fleet for 1870 to 1880 was 810, which includes Arctic whalers annually refitting at San Francisco and other ports. Of these voyages 382 were to the North and South Atlantic, 254 to the Pacific, Arctic, and adjacent grounds, 98 to the South Pacific, 45 to the Indian Ocean, and 36 to the Atlantic Arctic grounds, Hudson Bay, Davis Strait, and Cumberland Inlet.

Year.	Ships and barks.	Brigs.	Schooners.	Total vessels.	Total tonnage.
1870	217	22	77	316	72,173
1871	214	18	48	280	67,909
1872	170	12	28	210	51,252
1873	151	12	28	191	46,230
1874	129	7	25	161	39,788
1875	118	8	26	152	36,230
1876	121	7	30	158	37,182
1877	120	8	34	162	36,476
1878	128	11	39	178	39,976
1879	123	12	42	177	39,391
1880	126	9	46	181	38,637

Table showing the value of sperm-oil, whale-oil, and whalebone landed by the American fleet, the value of the consumption in the United States, and the value of the exportation annually from 1870 *to* 1880.

Year.	Landed by the fleet.*	Consumption in the United States.	Exportation.
1870	$4,529,126	$2,896,883	$1,476,864
1871	3,691,469	2,798,408	1,479,153
1872	2,954,783	2,081,468	1,374,098
1873	2,962,106	1,947,037	929,247
1874	2,713,034	2,154,638	1,179,286
1875	3,314,800	1,700,823	1,494,727
1876	2,639,463	1,346,828	1,487,533
1877	2,309,569	1,113,681	924,175
1878	2,232,029	849,043	1,357,162
1879	2,056,069	1,345,582	582,994
1880	2,659,725	1,165,944	795,657

* From half a million to a million dollars' worth of products are carried over from year to year.

Table showing the number of barrels of sperm and whale oil and pounds of whalebone landed by the American fleet, the quantities consumed in the United States, and the quantities exported annually from 1870 *to* 1880.

SPERM-OIL.

Year.	Amount landed.	Consumption.	Exportation.
	Barrels.	*Barrels.*	*Barrels.*
1870	55, 183	28, 812	22, 733
1871	41, 534	33, 528	22, 156
1872	45, 201	24, 052	24, 344
1873	42, 053	24, 190	16, 238
1874	32, 203	21, 768	18, 675
1875	42, 617	18, 453	22, 802
1876	39, 811	14, 473	23, 600
1877	41, 119	31, 737	18, 047
1878	43, 508	11, 124	32, 769
1879	41, 308	23, 315	11, 843
1880	37, 614	13, 750	12, 283

WHALE-OIL

1870	72, 691	68, 452	9, 872
1871	75, 152	63, 011	18, 141
1872	31, 075	42, 852	1, 528
1873	40, 014	33, 881	2, 153
1874	37, 782	44, 357	3, 300
1875	34, 594	31, 860	5, 424
1876	33, 010	22, 620	10, 300
1877	27, 191	20, 501	6, 390
1878	33, 778	12, 557	14, 371
1879	23, 334	24, 885	7, 374
1880	34, 776	23, 856	4, 395

WHALEBONE.

	Pounds.	*Pounds.*	*Pounds.*
1870	708, 365	255, 347	347, 918
1871	600, 655	319, 856	387, 199
1872	193, 793	74, 141	177, 932
1873	206, 396	155, 351	120, 545
1874	345, 560	208, 807	165, 553
1875	372, 303	143, 067	205, 436
1876	150, 628	150, 628	133, 400
1877	160, 220	67, 820	70, 800
1878	207, 259	96, 859	113, 400
1879	286, 280	183, 565	75, 715
1880	464, 028	176, 770	171, 258

DESCRIPTIVE LABELS ACCOMPANYING THE OBJECTS.

MODELS.

WHALE-SHIP, "CAMELS," WHALE-BOAT, AND TRY-WORKS.

MODEL OF WHALE-SHIP.

Sails clewed up and down for cutting. Sperm-whale alongside, decapitated; forward and after stages rigged outboard. Try-works between foremast and mainmast. Four boats on the cranes; two spare boats on the skids. Officers engaged in cutting and boarding; crew at windlass. American ensign at mizzen peak. Length over all, 4 feet 4 inches; beam, 11½ inches. Edgartown, Massachusetts, 1876. 25726. C. H. Shute & Son.

CAMELS.

Two water-tight compartments; each provided with a propeller, a smokestack, and a series of windlasses. Scale, 1 inch to 5 feet 5 inches. Length, 2 feet 1¼ inches. 25027. William H. Chase. A kind of lighter made in two sections, divided lengthwise, for floating loaded vessels over Nantucket Bar. The model with the hull of a vessel shows the manner in which the "camels" were operated.

WHALE-BOAT.

One-sixth the length of a thirty-foot boat, from which it was drafted, illustrative of all the parts of a boat used in Arctic whaling, with mast, oars, and rowlocks. New Bedford, Massachusetts, 1883. 57199. Made by James Beetle. U. S. Fish Commission.

TRY-WORKS.

Model of try-works common to all whaling vessels. Two pots "set"; copper cooler, wooden scrap-hopper, cast-iron deck-pot, accompanied by miniature models of the bailer, dipper, oil-scoop, and pot-spade. 17¼ by 12 by 8¾ inches. New Bedford, Massachusetts. 25013. Captain L. W. Howland.

APPARATUS OF CAPTURE.

AMERICAN WHALE-BOAT FULLY EQUIPPED FOR THE CAPTURE.

WHALE-BOAT.

A full-sized whale-boat with apparatus of capture. Length, 28 feet; beam, 5 feet 10 inches. New Bedford, Massachusetts. 72795. Gift of I. H. Bartlett & Sons.

OARS.

White ash. One steering-oar, 22 feet in length; and 5 pulling-oars, used by the boat-steerer, bow-oarsman, midship-oarsman, tub-oarsman, and stroke-oarsman. The oars for the oarsman vary in length as follows: Two about 16 feet long, two 17 feet, and one 18 feet. New Bedford, Massachusetts, 1882. Steering oar, 72796; harpoon-oar, 72797; bow-oar, 72798; midship-oar, 72799; tub-oar, 72800; stroke-oar, 72801. Gift of I. H. Bartlett & Sons.

PADDLES.

Made in two pieces, handle and blade. Sometimes used when approaching a whale in calm weather. Six paddles complete the outfit. New Bedford, Massachusetts, 1882. 72802; 72803; 72804; 72805; 72806; 72807. I. H. Bartlett & Sons.

ROWLOCKS.

Common spur oarlocks, iron, used by the boat-steerer, bow-oarsman, midship-oarsman, and stroke-oarsman. New Bedford, Massachusetts. 72821. Gift of I. H. Bartlett & Sons.

TUB-OARLOCK.

A double-decked oarlock, iron, with two rests for the oar, used by the tub-oarsman, who, when propelling the boat, uses the lower lock, and when fastened to the whale shifts the oar to the upper lock in order that the line may run out freely. New Bedford, Massachusetts, 1882. 72822. I. H. Bartlett & Sons.

HARPOONS.

Six toggle-irons; two on the iron crotch, and four spare irons. First iron attached to end of whale-line, second iron connected with the standing part of tow-line with the short warp. New Bedford, Massachusetts, 1882. 72824. I. H. Bartlett & Sons.

HAND-LANCES.

Three hand-lances, wrought-iron shanks, steel heads, wooden poles, strapped and rigged. Tied with nettles. New Bedford, Massachusetts. 72825. Gift of I. H. Bartlett & Sons.

BOAT-SPADE.

Wrought-iron spade edged with steel, wooden pole, strapped and rigged. Formerly used for stopping a running whale by severing the tendons at the junction of the caudal fin with the body, and used at present for cutting holes in the lips of the whale for reeving the tow-rope. New Bedford, Massachusetts. 72827. Gift of I. H. Bartlett & Sons.

WHALING-GUN.

Brand gun No. 2; muzzle-loading, skeleton iron stock. New Bedford, Massachusetts. 72820. Gift of I. H. Bartlett & Sons.

WHALEMAN'S LANCE-BAG.

Canvass bag used as a receptacle for bomb-lances in the boat when down for whales. The lances having been placed in the bag, which is painted or tarred, to render it impervious to water the wooden stopper or plug is inserted at the mouth and tightly bound with the twine. New Bedford, Massachusetts, 1882. 72819. Gift of I. H. Bartlett & Sons.

BOAT GRAPNEL.

An iron hook, with four barbless arms, used for picking up lines or other objects floating in the water when working about a dead whale prior to towing it to the vessel. Stiff ring for rope. Height 9 inches. New Bedford, Massachusetts, 1882. 72829. Presented by J. Barton.

IRON CROTCH.

A two-pronged implement in which the handles of the harpoon are placed when the boat is approaching a whale. Wood. One piece scarfed in two places at the top, and filled in with wedge-shaped pieces of wood, the projecting ends forming "crotches," into which the iron poles are placed. Small iron spike inserted into the foot, which is protected by a brass ferule. The iron spike ships into a socket in a cleat nailed to the inner edge of the gunwale on the starboard bow. Fastened to the boat with a small laniard. Length, 19 inches. Laniard, 22 inches. New Bedford, Massachusetts, 1882. 72823. I. H. Bartlett & Sons.

SHORT WARP.

A piece of whale-line fastened to the main warp with a bow-line and used to connect the second iron. Length, 4 fathoms. New Bedford, Massachusetts. 72828. Gift of I. H. Bartlett & Sons.

LINE-TUBS.

Receptacles for the whale-line. Oak staves bound with iron hoops. Bottoms perforated with numerous holes intersected by cross-

LINE-TUBS—Continued.

grooves cut into the wood, forming outlets and channels, through which such water as may accidentally get in the tubs may escape. Semicircular cut in upper end of one stave, through which the line is paid out when fast to a whale. Two ropes are spliced in staves on opposite sides and used as *lashings*, with which the tubs are made fast to thwarts to prevent their loss overboard. Large, 72808. New Bedford, Massachusetts, 1882. Small, 72809. Gift of I. H. Bartlett & Sons. Two tubs: The large tub, circular, contains 225 fathoms of line; the small tub, elliptical, contains 75 fathoms.

WHALE-LINE.

Manila, slack laid, three strands, circumference 2 inches. Three hundred fathoms of whale-line are usually carried in a boat, seventy-five fathoms in the small tub and two hundred and twenty-five in the large tub. Laid in Flemish coils in order that the line may run out freely when fastened to a whale. The "top end" of the line in the large tub is led forward and fastened to the first iron, and the bight of the line thrown over the loggerhead. New Bedford, Massachusetts, 1881. Large line, 72810. Small line, 72811. Gift of I. H. Bartlett & Sons.

DRUG (DRAG).

A drug made in the form of a tub, with a thick and strongly made bottom to withstand the resistance of water. Oak staves bound with iron hoops. Upright piece of hard wood morticed and toggled in bottom. Rope tail for bending on to harpoon. Used to impede the progressive motions of a wounded adult whale, or fastened to a calf to attract the attention and sympathy of its mother or other females. New Bedford, Massachusetts, 1882. 72843. I. H. Bartlett & Sons.

LANTERN-KEG.

A utensil included in the outfit of every American whale-boat, sometimes made by the cooper on board the vessel, and sometimes ashore. Oak staves; three iron hoops. Headed up at both ends. New Bedford, Massachusetts. 72812. I. H. Bartlett & Sons. The lantern-keg contains the boat-lantern, matches, tinder-box, candles, pipes, and tobacco, and sometimes ship-bread. Its position in the boat is invariably in the apartment aft, known as the cuddy, under which it is "slung" by rope-lashings.

BOAT-BUCKET.

A strongly made tub, heavy oak staves, with two projecting staves with holes in upper ends for a knotted rope bail or handle; iron hoops. New Bedford, Massachusetts. 72813. I. H.

BOAT-BUCKET—Continued.

Bartlett & Sons. As soon as the boat is fast to a whale the order is given to "Wet line!" and the man whose duty it is grasps the boat-bucket, and, dipping water from overboard, pours it into the line-tub to prevent friction as the line runs rapidly round the loggerhead.

BOAT-PIGGIN.

An ordinary piggin with a projecting stave as a handle, used for bailing the boat. New Bedford, Massachusetts, 1881. 72814. Gift of I. H. Bartlett & Sons.

WATER-KEG.

Oak staves, headed at both ends, bound with iron hoops, with an outlet for water on the upper end. Used as a receptacle for fresh water for the men when down for whales. New Bedford, Massachusetts, 1881. 72815. Gift of I. H. Bartlett & Sons.

BOAT-LANTERN.

A small oblong lantern with glass sides, and a tin socket for the reception of candles. Used as an ordinary lantern in the boat when down for whales if the capture is prolonged until night, and as a signal for the ship. New Bedford, Massachusetts, 1881. 72816. Gift of I. H. Bartlett & Sons.

BLACKFISH POKE.

The stomach of the Blackfish (*Globiocephalus*) deprived of its inner membrane, inflated, and dried, painted white, wooden plug inserted and seized in neck. Provincetown, Massachusetts. 72844. Gift of Stephen Cook. At times, when a whale is fast to a boat, it may run so rapidly, or sound to such a depth, as to take out all the line. Under such conditions the poke is bent on to the end of the line before it leaves the boat, and when the whale ceases its progressive motions the poke or buoy appears on the surface and the line is regained. It is also used in waifing dead whales or blackfish.

BOAT-HORN.

Used in a whale-boat as a fog-horn. Tin, japanned; mouth-piece, tin. Length, 13½ inches. Diameter of mouth, 2⅛ inches. New Bedford, Massachusetts, 1882. 72818. U. S. Fish Commission.

TINDER-BOX.

A water-proof box carried in the lantern-keg. Tin, small ring handle, painted. Contents: Flint, steel, and cloth, for lighting pipes when down for whales, or, perhaps, making fires on shore, if the boat should be engaged in whaling on soundings, and the crew feel disposed to warm themselves or to have a hot meal. Height, 2 inches. Diameter, 4½ inches. New Bedford, Massachusetts, 1882. 72817. Presented by John McCullough.

CRAFT.

WHALEMAN'S HARPOONS.

NON-EXPLOSIVE—THRUST BY HAND.

TWO BARBS AND FIXED HEAD.

HARPOON.

Harpoon with fixed head, double barbed. Slender neck. Length, 37 inches. 25010. U. S. Fish Commission.

HARPOON.

A very old harpoon, with a double-barbed fixed head, worn out in service by frequent applications to the grindstone. Wrought iron. Eye-splice for iron strap grafted at socket. Cut from a dead whale. Length, 30¼ inches. 25902. U. S. Fish Commission.

THE CARSLEY HARPOON.

Patented by William Carsley, of New Bedford, Massachusetts, July 29, 1841. A two-flued harpoon with fixed head, so constructed that the barbs are made to stand obliquely to the axis of the shank. On entering the whale the instrument cuts "its way in an oblique or spiral direction, making the incision such that when a strain is brought to bear upon the line attached to the harpoon, either by the resistance of the animal, its efforts to escape, or otherwise, the flukes or barbs will be brought into a position more or less nearly at right angles with the lips of the incision, making it vastly more difficult than is the case with the common harpoon for it to be drawn out backward by returning in the direction of the cut or wound."—(Specification of patent.) Length, 37 inches. Fairhaven, Massachusetts, 1882. 56226. Painted vermilion. Manufactured and presented by Luther Cole.

DOUBLE-BARBED HARPOON.

Primitive style. Has evidently been used in capturing a whale. Not employed at present. Length, 31¾ inches. 56246. U. S. Fish Commission.

TWO-FLUED HARPOON.

A kind of harpoon known as the "English harpoon," formerly used in the American fleet, having been obtained from English vessels. Head fixed; two barbs with reverse barbs or "beards" on the rear ends. Chilled wrought iron. Marked "L. B. & Co." (Manufacturers). Length, 38½ inches. New London, Connecticut. 56257. Gift of C. A. Williams & Co.

TWO-FLUED HARPOON.

A kind of harpoon with fixed head employed in the American fleet during the early days of whaling. Has been used in capturing a whale. Wrought iron. Length of harpoon, 42 inches. Length of barbs, $6\frac{3}{4}$ inches. New London, Connecticut, 1882. 56258. Gift of Lawrence & Co.

HARPOON.

Harpoon with a double-barbed fixed head; wrought iron. Marked "Macy" (Manufacturer). Length, 30 inches. New Bedford, Massachusetts, 1882. 56259. Presented by Mackey & Pindar. A style of harpoon with a large head. Formerly used.

TWO-FLUED HARPOON.

Harpoon with double barb and fixed head. Length, $29\frac{1}{2}$ inches. New Bedford, Massachusetts 1882. 56263. U. S. Fish Commission.

TWO-FLUED HARPOON.

Harpoon with two fixed barbs, and one movable barb pivoted at one side at rear of fixed head. Barbs and shank wrought iron. Length, 33 inches. Provincetown, Massachusetts. 56264. U. S. Fish Commission.

TWO-FLUED HARPOON.

Harpoon with double-barbed fixed head; wrought iron. Diameter of shank reduced by tractile force. Length, $32\frac{3}{4}$ inches. New Bedford, Massachusetts, 1882. 56265. Gift of Mackey & Pindar.

TWO-FLUED HARPOON.

Common harpoon with a fixed wrought-iron head; two barbs. Shank, wrought iron, reduced in diameter by tractile force. Cut from a dead whale. Marked "B K P T" (initials of bark). Length, 34 inches. New Bedford, Massachusetts, 1882. 56266. Gift of John A. Sawyer.

TWO-FLUED HARPOON.

Harpoon with double-barbed fixed head; wrought iron. Stamped "G. S." (Manufacturer). Length, 36 inches. Nantucket, Massachusetts, 1882. 56267. Gift of Joseph B. Macy.

WHALEMAN'S HARPOON.

The typical harpoon, with pole and iron strap, formerly used for striking whales, but superseded by the improved style technically termed the "toggle-iron." Total length, 9 feet 5 inches. New Bedford, Massachusetts. 56403. Gift of John McCullough. This harpoon is over thirty years old, and was found in the loft of a warehouse where it had remained for as many years.

WHALEMAN'S HARPOON—Continued.

It belongs to that series of harpoons which have fixed heads and two barbs, and is in the condition in which it is intended to be used, with the exception that the points should be ground to a razor's edge and the shank cleaned and polished, in order that no obstruction may be offered when penetrating the blubber and flesh.

SINGLE-BARBED HARPOONS—FIXED HEADS.

ONE-FLUED HARPOON.

Harpoon with single recurved barb. Marked "S. Lydia." Length, 32¼ inches. New London, Connecticut, 1882. 56249. Gift of Lawrence & Co.

ONE-FLUED HARPOON.

Harpoon with a fixed single barb and hinged toggle. Barbs and shank, wrought iron. Length, 35 inches. Provincetown, Massachusetts, 1882. 56250. U. S. Fish Commission.

HARPOON.

Harpoon with one recurved fixed barb and one adjustable barb. The latter is rigidly fastened to the forward end of a wrought-iron rod. The rod is made fast to a cast-iron sliding collar or socket. The sliding socket has an eye into which one end of the iron strap may be bent. The combination of sliding socket, arm, and adjustable barb moves around, or parallel to, the shank. A wrought-iron eye is welded near the rear end of the shank, through which the iron strap may be rove. When the instrument is to be darted, the adjustable barb is closely fitted to the rear of the fixed barb, where it is held in position by a small wooden pin. The resistance upon the line, which is rove through the stationary eye and made fast to the rigid eye on the sliding socket, gives the under barb a twisting motion which brings it at right angles, or otherwise, to the point of incision, more firmly fastening the instrument in the flesh of the whale. Length, 35 inches. New London, Connecticut, 1882. 56251. Gift of C. A. Williams & Co. Probably a modification of a harpoon patented October 20, 1857, by James Q. Kelly, of Sag Harbor, New York.

ONE-FLUED HARPOON.

Harpoon with fixed head, single barb. Barb and shank, wrought iron. Marked "E. Park" (Manufacturer). Cut from a dead whale. Length, 36 inches. Nantucket, Massachusetts, 1882. 56252. Gift of Joseph B. Macy.

ONE-FLUED HARPOON.

Harpoon with single barb and fixed head; diameter of neck of shank reduced, in order that it may be bent in the weak place by the action of the flesh and act upon the principle of a toggle; head and shank, wrought iron. Length, 37 inches. New Bedford, Massachusetts, 1882. 56253. Manufactured by Mr. James D. Driggs and presented by Capt. James V. Cox. This style of harpoon was at one time used, and it is believed by some whalemen that it suggested the idea of the toggle-iron. None of them are used at present.

ONE-FLUED HARPOON.

Harpoon with one fixed barb and hinged toggle; barbs and shank, wrought iron. Socket, partly wrapped with marline. Marked "J. B. Morse" (Manufacturer). Length, 33¼ inches. Edgartown, Massachusetts, 1882. 56254. U. S. Fish Commission.

ONE-FLUED HARPOON.

Harpoon with fixed head; single wrought-iron recurved barb. Shank, wrought iron. Marked "Howard, 1111" (Name of vessel and number of boat). Cut from a dead whale. Length, 33 inches. New London, Connecticut, 1882. 56255. Gift of Lawrence & Co.

IMPROVED HARPOON, OR TOGGLE-IRON.

TOGGLE-IRON.

Toggle, malleable cast iron, mortised and pivoted to shank. Shank, wrought iron; slotted for toggle. Point broken. Length, 31¼ inches. New Bedford, Massachusetts, 1876. 25642. Gift of W. H. Cook & Co. Has been used in capturing a whale.

TOGGLE-IRON.

Diameter of shank reduced by tractile force. Head, malleable cast iron, mortised. Shank, wrought-iron. Cut from a dead whale. Length, 36 inches. Provincetown, Massachusetts. 29398. Presented by Capt. J. G. Fisher. Used by Captain Fisher in capturing a whale.

THE DOYLE HARPOON.

A kind of harpoon invented by George Doyle, of Provincetown, Massachusetts, November 2, 1858. The nature of this invention consists in attaching the shank to the head in such a manner that when the harpoon has been thrust into the whale it shall present the broad flat side of the head instead of the rear edge. The head may be made of cast steel or other suitable material, with a longitudinal slot extending from the center backward to receive the end of the shank. Shank, wrought iron, pivoted to the head with a steel pin. Length, 34¼ inches.

THE DOYLE HARPOON—Continued.

Provincetown, Massachusetts, 1882. 56231. Gift of I. A. Small.

TOGGLE-IRON.

Shank twisted to show the tenacity and durability of the iron employed in the manufacture of harpoon-shanks. Head consists of the common malleable cast-iron toggle, with a diamond point. Shank, wrought-iron. New Bedford, Massachusetts, 1876. 56233. Gift of E. B. & F. Macy.

TOGGLE-IRON.

Shank twisted by the actions of a dying whale. Marked "D. & B." (Manufacturers); "B K D A R") (initials of bark). Length, 29½ inches. New Bedford, Massachusetts, 1882. 56237. Gift of Jonathan Bourne.

TOGGLE-IRON.

Shank elongated by tractile force. Head, malleable cast iron, mortised. Shank, wrought iron. Cut from a whale. Length, 32¼ inches. New Bedford, Massachusetts, 1882. 56242. Gift of John A. Sawyer.

TOGGLE-IRON.

A kind of harpoon, with a small toggle known as the "Sag Harbor iron." Head, malleable cast iron. Shank, wrought-iron. Length, 38½ inches. New Bedford, Massachusetts, 1882. 56243. Gift of Mackey & Pindar.

TOGGLE-IRON.

Head, wrought iron, pivoted in cheeks of forward part of shank. Toggle has two flukes, one at forward and one at after end. Shank, wrought iron; head mortised for toggle. Marked "E. S." (Manufacturer). Length, 38½ inches. New Bedford, Massachusetts, 1882. 56244. Gift of Jonathan Bourne.

NICKEL-PLATED TOGGLE-IRON.

Head, malleable cast iron, mortised; shank, wrought iron. Length, 34 inches. Fairhaven, Massachusetts, 1882. 56245. Manufactured and presented by Luther Cole. The kind of harpoon, commonly known as the "toggle-iron," used at present by all American whalemen. Full size.

TOGGLE-IRON.

Harpoon with movable head or toggle pivoted in cheeks of shank, with two barbs at point and a flaring barb or fluke at rear extremity. Shank, wrought iron, slotted for toggle. Cut from a dead whale. Length, 33 inches. New Bedford, Massachusetts, 1882. 56247. Gift of Jonathan Bourne.

TOGGLE-IRON.

Toggle-iron with loop twisted in the shank by the actions of a wounded whale. Head, malleable cast iron; shank, wrought iron. Length, 30¾ inches. New Bedford, Massachusetts, 1882. 56248. Gift of Aiken & Swift. (Manufactured by Luther Cole, Fairhaven, Massachusetts.)

GROMMET-IRON.

Head consists of a mortised steel toggle, with a smooth point and a barb or fluke at the rear extremity; shank, wrought iron; socket served with marline and with an eye-splice for bending on the whale-line; two rope grommets for holding the toggle in position when darted. Length, 26 inches. New Bedford, Massachusetts, 1882. 56256. Gift of Messrs. L. & W. R. Wing & Co. A kind of iron known as the "grommet-iron;" may be used in striking the walrus, but not used at present in capturing the whale.

GROMMET-IRON.

Head, toggle with diamond point, wrought iron, held in position when darted by an iron link or "grommet;" shank, wrought iron; socket wound with marline, around which the iron-strap is fastened. Length, 26½ inches. New Bedford, Massachusetts, 1882. 56268. Gift of John McCullough. A kind of harpoon manufactured at an early date and known as the "grommet-iron" from the fact that its barb or toggle was confined to the shank with a "grommet" instead of a small wooden pin, which latter is now in general use. None of the irons of this character are used at present. They have been used in striking the whale or walrus, being better adapted for the latter on account of the short shank and small head.

TOGGLE-IRON.

Head and portion of shank of common toggle-iron. Toggle pivoted to shank. Length, 9¾ inches. 56404. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of common toggle-iron. Toggle, malleable cast iron. Length, 6¾ inches. 56405. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of toggle-iron. Evidently a kind of lily-iron intended to be used for striking the sword-fish or porpoise. Toggle with double diamond point; slotted and hinged at center to end of shank. Shank, wrought iron. Length, 10½ inches. 56406. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of toggle-iron. Evidently intended for striking sword-fish, porpoises, and black-fish. Head, steel, mortised. Shank, wrought iron. Length, 10 inches. 56407. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of toggle-iron. Toggle pivoted between the cheeks of shank. Toggle has two barbs; one front and rear. Length, $9\frac{3}{4}$ inches. 56408. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of toggle-iron. Toggle, wrought iron, elongated point, fluked at rear end; slotted and pivoted to end of shank. Intended to be used in striking sword-fish or porpoises. Length, $10\frac{3}{4}$ inches. 56409. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of a harpoon known as "Doyle's iron." Patented November 2, 1858, by George Doyle, of Provincetown, Massachusetts. Head, malleable cast iron. Length, $12\frac{3}{4}$ inches. 56410. Gift of A. R. Crittenden. The peculiarity of the head of this kind of iron is that it is so arranged as to present the flat side of the blade when fastened in the whale.

TOGGLE-IRON, WITH POLE.

Toggle, malleable cast iron; shank, wrought iron. New. Length, including pole, 10 feet 4 inches. Length of harpoon, 33 inches. Length of toggle, 8 inches. Fairhaven, Massachusetts, 1883. 56416. U. S. Fish Commission. The present form of harpoon used by American whalemen.

TOGGLE-IRON, WITH POLE.

Toggle made of hoop-iron, held by a rope grommet. Roughly-made pole. Socket served and iron strap attached. Length, 9 feet. New Bedford, Massachusetts, 1882. 57698. Gift of Jonathan Bourne. A peculiar harpoon made on board ship, probably by the blacksmith, evidently intended for striking blackfish or porpoise.

HARPOONS FOR RAISING "SUNK" WHALES.

HUMPBACK-IRON.

Toggle, malleable cast iron, mortised, and pivoted to shank. Shank $\frac{5}{8}$ inch wrought iron. Total length, 34 inches. Total length of toggle, $10\frac{1}{2}$ inches. New Bedford, Massachusetts, 1882. 56269. Gift of Jonathan Bourne. A kind of harpoon, known as the "Humpback-iron," for raising sunk whales.

HUMPBACK-IRON.

Toggle, malleable cast-iron, mortised, pivoted to shank. Shank, wrought iron, with slot for toggle. Total length, 40 inches. Length of barb, $10\frac{3}{4}$ inches. New Bedford, Massachusetts, 1882. 56270. U. S. Fish Commission (manufactured by Jas. Barton). A kind of harpoon, known as the "Humpback-iron," used for raising sunk whales (*Megaptera* sp.).

HUMPBACK-IRON.

Rough specimen of a kind of harpoon, known as the *Humpback-iron*, used in raising sunk whales. Wrought iron, forged and manufactured on board ship. Length, 33 inches. New Bedford, Massachusetts, 1882. 56271. Gift of Jonathan Bourne.

DARTING-GUN HARPOONS.

THRUST BY HAND, BUT NOT FIRED FROM THE GUN (NEW).

PIERCE'S DARTING-GUN IRON.

Head, malleable cast iron; shank, wrought iron; loop welded to shank near the butt for making fast the end of the tow-line. The rear end tapers to a blunt point for insertion into the lugs of the darting-gun. Length, 29 inches. New Bedford, Massachusetts, 1876. 25680. Gift of W. H. Cook & Co.

THRUST BY HAND AND FIRED FROM THE GUN (OLD.)

PIERCE'S DARTING-GUN HARPOON.

Temple gig. Shank consists of two conjoined parts; forward part wrought iron, extreme end morticed for the toggle; rear portion, iron piping with screw at one end for tip; tip wanting; iron arm pivoted in a slot in the shank at one end; in the other end there was intended to be an eye, or loop, in which the strap for bending on the whale-line should be fastened. Eye, wanting. Length, $23\frac{1}{4}$ inches. Provincetown, Massachusetts, 1882. 56209. Gift of I. A. Small. Formerly used in connection with the first darting-gun.

PIERCE'S DARTING-GUN HARPOON.

Temple gig, shank in two sections; forward part, wrought iron, extreme end mortised for toggle; rear portion, iron piping. Wrought-iron link for making fast end of whale line. Button, felt. Length, 23 inches. Provincetown, Massachusetts, 1882. 56222. Gift of Capt. William Roberts. Made especially for the first darting gun.

PIERCE'S DARTING-GUN HARPOON.

Head, common toggle, mortised, pivoted to end of shank. Shank, composed of two conjoined pieces of iron. Forward end, rod

PIERCE'S DARTING-GUN HARPOON—Continued.

iron; rear portion piping, screwed into end of forward part. Iron-link, twisted, attached to middle of shank for iron-strap. Iron-strap, whale-line. Button, felt. Point of toggle fractured. Length, 24½ inches. Provincetown, Massachusetts, 1882. 56227. Gift of I. A. Small. Marked "B N——" (initials of vessel). Formerly used with the first darting gun.

PRUSSIC ACID HARPOONS.

PRUSSIC ACID HARPOON WITH FIXED HEAD.

Consists of a fixed head of highly-tempered steel, with two rigid steel blades slotted on either side at right angles, and two movable barbs pivoted, one on either side, to its rear; and of a sliding attachment, moving independently of the fixed head, composed of two rigid and two movable barbs. The shank is wrought iron, with a socket at one end, and a slot, 8 inches in length, cut by hand, in the other. The piece composing the adjustable barbs is cast with a longitudinal slot on either side, to correspond in size to the sides of the slotted end of the shank. In process of manufacture the sides of the slotted end of the shank are heated and "spread"; the movable barbs having been inserted, the sides are closed permanently to prevent the barbs from being released, but affording ample room for them to move back and forth longitudinally. The vials of poison may be inserted in the space between the fixed head and the independent barbs. When the harpoon is thrown into the whale the action of the flesh and the resistance upon the line draws the adjustable barbs in the direction of the fixed head, crushes the vials, and destroys the whale. Length, 45 inches. Nantucket, Massachusetts, 1882. 56260. Gift of Mr. Joseph B. Macy. Rare. Not used at present.

PRUSSIC ACID HARPOON WITH ADJUSTABLE HEAD.

The head consists of a diamond-pointed, highly tempered piece of steel, with two rigid fin-like blades, or barbs, slotted through it at right angles; two movable flukes, or toggles, pivoted to its rear; and a neck, cast with the head, 9 inches long. The shank terminates in a socket for the pole, and is slotted at the forward end, forming a recess for the neck. The neck is adjusted longitudinally in the slot in such a manner that while it may be moved back and forth with great facility, being held by a metal pin, it cannot be separated from the shank. The neck is fluted or grooved on the two sides which are abreast the openings of the slot near the end of shank. Two vials of poison may be placed respectively in the recesses when the head is in repose. When the instrument is imbedded in the

PRUSSIC ACID HARPOON WITH ADJUSTABLE HEAD—Continued.

flesh of the whale, the counter-resistance upon the line—the whale moving in the direction of the head, and the weight of the boat being brought to bear upon the shank—the adjustable head and neck are drawn out until stopped by the metal pin crushing the vials and destroying the whale. Length, 49 inches. Nantucket, Massachusetts, 1882. 56261. Gift of Joseph B. Macy. Rare. Not used at present.

HARPOONS PROJECTED FROM GUNS.

NON-EXPLOSIVE.

SMITH'S GUN-HARPOON.

Head, or toggle, slotted. Double shank, wrought iron. Endless wire loop for making fast one end of whale-line; leather pad. Provincetown, Massachusetts, 1876. 29396. Gift of Lemuel Cook 2d. Seldom used at present.

ALLEN'S GUN-HARPOON.

Galvanized. Patented December 5, 1848, by Oliver Allen, of Norwich, Connecticut. Fixed head with four barbs. The shank about half its length is composed of an iron rod, which termi nates in a head or button and socket; the rear portion of the shank malleable cast iron. At the junction of the two pieces of shank is a collar intended to be used as a *stop* for the *iron-strap*. Not in use at present. Length, 43½ inches. Provincetown, Massachusetts, 1876. 29500. Gift of E. K. Cook.

GUN-HARPOON.

Fixed head, double barbed, diamond point, steel. Two movable flukes, wrought iron, pivoted below head. Shank, double, wrought iron; leather button, screwed. Endless wire loop with leather pad. Length, 16½ inches. Middletown, Connecticut, 1882. 54333. Gift of A. R. Crittenden.

SMITH'S GUN-HARPOON.

Movable barb. Head of shank cast with slot for barb; shank, malleable iron, double, provided with wire loop into which may be bent one end of the iron-strap. Formerly used in connection with the shoulder-gun. Middletown, Connecticut, 1882. 54334. Gift of A. R. Crittenden. Not used at present.

KELLY'S GUN-HARPOON.

Head, toggle, malleable cast iron, mortised. Shank, wrought iron, with collar at butt. Adjustable slide, to which is attached rope-beckets. Button, rubber. Cushion-spring broken. Marked "B. G. L. A. 111." (Initials of brig and number of boat).

KELLY'S GUN-HARPOON—Continued.

Iron-strap consists of two rope loops, or beckets, about 10 inches long, with leather in the eyes where they are made fast to the slide. Length, 26¾ inches. New Bedford, Massachusetts, 1882. 56210. Gift of Thomas Knowles & Co.

GUN-HARPOON WITH FLAT SHANK.

Head, common toggle. Eye made in a piece of strap-iron riveted to the shank, with hole for splicing in iron-strap. Button, leather, attached with screw. Length, 23 inches. New Bedford, Massachusetts, 1882. 56211. U. S. Fish Commission. Designed and manufactured by Captain Eben Pierce, as an experiment. None in use. Point broken off. Has been fired into a gravel-bed.

SMITH'S GUN-HARPOON.

Temple gig, pivoted in the cheeks of the forward end of shank. Shank, double, cast. Wire loop and thimble for iron-strap. Length, 29 inches. New London, Connecticut, 1882. 56212. Gift of Lawrence & Co. Not used at present.

BROWN'S GUN-HARPOON.

Fixed head, diamond point, with projecting lanceolate blades on sides and top; two toggles in rear pivoted to a fixed head. Shank, flat; fluted on both sides; two holes near the head and one in rear end for iron-strap. Length, 35½ inches. Fairhaven, Massachusetts, 1882. 56213. Gift of Luther Cole.

BROWN'S GUN-HARPOON.

Head, double-barbed, diamond pointed, surmounted at right angles by lance-like cutting-point. Head cast in one piece. Two movable barbs, pivoted, one on either side, in the rear of fixed head. Shank, cast-iron, flat and fluted; two holes at forward end of shaft and one hole at the butt for making fast the iron-strap. Button, iron. Length, 37 inches. New Bedford, Massachusetts, 1882. 56214. Gift of John McCullough.

SHOULDER GUN-HARPOON.

Head, common toggle; malleable cast-iron; mortised and pivoted to shank. Shank, single, round, wrought iron. Button, iron. Marked "B. G. A." (Initials of name of brig), "111" (No. of boat), "Dean & Sawyer" (Manufacturers). Length, 37 inches. New London, Connecticut, 1882. 56215. Gift of C. A. Williams & Co.

BROWN'S SHOULDER GUN-IRON.

Head fixed, four barbs, the main portion of which consists of the two ordinary harpoon barbs surmounted at right angles by

BROWN'S SHOULDER GUN-IRON—Continued.

two other smaller barbs which are brazed to the former at the extreme end. Barbs, steel; head welded to shank. Shank, forged wrought iron; fluted on both sides for the reception of the iron-strap which accompanies the harpoon when placed in the gun; rear extremity of the shaft terminates in a button or boss; two holes near the head of the shaft, and one hole in the rear end, to which is made fast the iron-strap. Length, 37¼ inches. New Bedford, Massachusetts, 1882. 56216. Gift of John McCullough. Seldom used at present.

SHOULDER GUN-HARPOON.

Head consists of two barbs, forward extremity diamond pointed, rear extremity forming a fluke, the whole acting upon the principle of a toggle; slotted and pivoted to shank; shank, double, cast-iron. Length, 36 inches. Nantucket, Massachusetts, 1882. 56218. Gift of Joseph B. Macy.

BROWN'S GUN-HARPOON.

Used in connection with the shoulder-gun. Head, double-barbed, fixed, diamond point; two toggles, one on either side, pivoted to rear portion of main head, and slotted to fold over the plates. Shank, cast-iron, fluted on both sides; two holes in the head of shaft, and one hole near the butt into which is spliced the iron-strap. Shank has been broken and brazed, as the quality of iron would not permit welding. Length, 31¾ inches. New London, Connecticut, 1882. 56219. Gift of Messrs. Lawrence & Co.

SMITH'S GUN-HARPOON.

Head malleable iron, three cutting-edges; flukes, malleable iron, pivoted in slot in forward part of shank. Shank, double; cast-iron. Wire loop for attaching the tow-line. Length, 25½ inches. Provincetown, Massachusetts, 1882. 56220. U. S. Fish Commission. Seldom used at present.

THE MASON GUN-HARPOON.

Cast-iron. Lance-like cutting point and two movable barbs. Shank, grooved; eye in butt for rope. Length, 22 inches. New Bedford, Massachusetts, 1882. 56221. Gift of H. W. Mason. Recent invention.

KELLY'S GUN-HARPOON.

Head, common toggle, malleable cast-iron, mortised; shank, wrought-iron, with collar at butt; adjustable slide, with rigid eyes in which loops, or beckets, made of rope are fastened; spiral cushion-spring to neutralize the shock of sudden stoppage; button wanting. Length, 26½ inches. New Bedford, Massa-

KELLY'S GUN-HARPOON—Continued.

chusetts, 1882. 56223. Gift of Thomas Knowles & Co. Patented by Zeno Kelly, New Bedford, Massachusetts, December 3, 1867. Seldom used at present.

SWIVEL GUN-HARPOON.

Head, common toggle, slotted and pivoted to shank. Shank composed of a single rod of wrought-iron, with forged iron button at rear extremity. Marked "B. G. A., 11." "Dean & Sawyer" (Manufacturers). Length, 48 inches. New London, Connecticut, 1882. 56224. Gift of C. A. Williams & Co.

SWIVEL GUN-HARPOON.

Head consists of toggle, double-barbed; toggle slotted and pivoted to end of shank; shank double, wrought-iron, welded at both ends; button at rear end. Length, 46 inches. Edgartown, Massachusetts, 1882. 56225. Gift of Messrs. Osborn & Co.

SMITH'S GUN-HARPOON.

Malleable iron; one pivoted malleable cast-iron fluke. Shank, double; head with slot for fluke. Wire loop for iron-strap, wrapped with marline. Length, 25½ inches. Provincetown, Massachusetts, 1882. 56228. Gift of Stephen Cook. Seldom used at present.

ALLEN'S GUN-HARPOON.

Head, fixed; four barbs. Forward part of shank, wrought iron; rear part, iron piping, welded to rear end of forward part. Length, 44¼ inches. Provincetown, Massachusetts, 1882. 56229. U. S. Fish Commission. None in use at present. Erroneously called Broomstick-lance.

ALLEN'S GUN-HARPOON.

Head, fixed; four barbs. Shank consists of two pieces of conjoined iron; for about one-half its length it is composed of an iron rod, with a head or button at its rear end, which is intended as a *stop* for the iron-strap; the rear part of the shank is cast with four strips of metal meeting each other at right angles; the forward end fitting in the socket of the first piece. Length, 44¾ inches. New Bedford, Massachusetts, 1882. 56230. U. S. Fish Commission. Not used at present. Formerly fired from shoulder-guns.

SMITH'S GUN-HARPOON.

Head, slotted; shank, double, wrought iron. Loop for making fast end of tow-line, wire, wrapped with spun-yarn. Button, wanting. Length, 26¼ inches. Provincetown, Massachusetts, 1882. 56232. U. S. Fish Commission. Seldom used at present.

BROWN'S GUN-HARPOON.

With iron-strap attached. Head, diamond point, fixed; toggle pivoted on either side. Shank, flat, fluted on both sides; one hole at butt, and two holes in forward end into which is spliced the iron-strap. Iron-strap, 1½ inch rope, free end unlaid. Length, 35½ inches. New London, Connecticut, 1882. 56234. Gift of Lawrence & Co. Seldom used at present.

GUN-HARPOON.

Temple gig; shank, single, round; button, iron. Hole in end of shank for rope. Length, 42½ inches. New Bedford, Massachusetts, 1882. 56235. Gift of Thomas Knowles & Co.

SWIVEL GUN-HARPOON.

Head, wrought iron, double-barbed. Shank, malleable iron, cast; double or slotted. Loop with two eyes, wire, wrapped with wire; iron thimble attached, with rope for making fast the whale-line. Marked "S. Lydia." Length, 48 inches. Edgartown, Massachusetts, 1882. 56236. U. S. Fish Commission. Cut from a dead whale.

PIERCE'S GUN-HARPOON.

Head, or toggle, malleable cast iron. Shank, forward part wrought iron; rear part, piping. Felt tip. Iron-strap, whale-line, spliced at one end in eye in shank, and with an eye-splice in the other for making fast one end of the tow-line. Length, 26 inches. New Bedford, Massachusetts, 1882. 56238. U. S. Fish Commission. Manufactured by Captain Eben Pierce. Old style, formerly used with the first darting gun.

ALLEN'S GUN HARPOON.

Four fixed barbs. Shank in two sections; forward part wrought-iron terminating in a socket, into which is fitted the rear part; provided with a fixed iron collar to be used as a stop for the iron-strap. Rear portion of shank wood with iron ferule. Length, 46¼ inches. New Bedford, Massachusetts, 1882. 56239. U. S. Fish Commission. Formerly used with the shoulder-gun.

SWIVEL GUN-HARPOON.

Fixed head, double barbed; double-shank; branded "Tinkham" (Manufacturer). Head, wrought-iron; shank, malleable cast iron. Length, 48½ inches. New London, Connecticut, 1882. 56240. Gift of Messrs. Lawrence & Co.

SWIVEL GUN-HARPOON.

Double shank. Shank and toggle malleable cast iron. Marked "B. K. M. T." (Initials of bark to which the harpoon belonged). Length, 51 inches. Nantucket, Massachusetts, 1882. 56241. Gift of Joseph B. Macy.

THE CALIFORNIA GUN-HARPOON.

Head, common toggle, with flaring barb at rear, wrought iron, mortised; shank, double; wire loop, served with twine; iron-strap and eye-splice. Length, 50 inches. Length of toggle, $9\frac{5}{8}$ inches. San Miguel, California, 1882. 72753. Manufactured and presented by George W. Proctor. Used in connection with the swivel gun at the whaling stations on the coast of California, and other points on the northwest coast, for the capture of the California grays, humpbacks, finbacks, and right whales.

EXPLOSIVE HARPOONS.

THRUST BY HAND.

BARKER'S BOMB-HARPOON.

A harpoon with an adjustable explosive lance-like head, intended to be used for simultaneously "fastening to" and killing whales. Length, 33 inches. Provincetown, Massachusetts, 1882. 56370. Gift of D. Connell. This kind of instrument is intended to be darted by hand. The resistance of the skin of the whale upon the brass cross-piece draws back the discharging-wire which extends parallel to the shank, causing the hammer to strike upon the cap, and explodes the bomb, or head, in the whale. When the whale runs, or sounds, the traction of the line upon the harpoon expands the brass barb, or fluke, and prevents the instrument from being withdrawn. Reloaded by the substitution of a new head. Patented by Silas Barker, February 21, 1865.

FREEMAN'S BOMB-HARPOON.

An instrument with an explosive head for killing whales. Consists of a chambered head, or magazine, which, when loaded, contains a charge fully equal to three-fourths of a pound of powder; a shank with a tubular head and two small rigid barbs, and socket for the pole. The inside mechanism consists of a time-fuse, which extends from the shank into the magazine, a nipple for the percussion-cap, an actuating spring, and other appliances for releasing the cock, which are concealed in the recessed head of the shank. The trigger, or lever-fluke, is fastened by a hinge-pin immediately in rear of the lance-bomb. The action of the flesh as the instrument enters the whale presses down the trigger, or fluke, in a line with the shank, and automatically explodes and impels the head. Reloaded by substituting new heads. Length, $40\frac{1}{2}$ inches. Brewster, Massachusetts, 1876. 42762. Made by Freeman & Lincoln. This kind has been employed for killing the finback whale on the coast of Cape Cod, Massachusetts. Patented by Charles Freeman, Brewster, Massachusetts, May 7, 1872.

PROJECTED FROM GUNS.

MASON'S HARPOON.

Designed for an improved swivel-gun. Consists of a point with three cutting edges and cast-iron bomb, cast-iron shank with four parallel grooves on the sides, and an eye at the butt for the iron-strap. Two movable flukes are fastened with a set-screw to the forward end of the shank in rear of the bomb. Length, 31¾ inches. New Bedford, Massachusetts, 1882. 56376. Manufactured and presented by H. W. Mason. Recent invention.

WALRUS HARPOONS.

Common toggle-irons; shanks, wrought iron; toggles, malleable cast iron, mortised; stamped "L. Cole" (Manufacturer). Total length (56415), 22 inches; total length (56413), 22½ inches; length of toggles, 6 inches. Fairhaven, Massachusetts, 1883. U. S. Fish Commission. Used by whalemen in the Arctic regions in the capture of walrus.

IRON SHEATHS.

SHEATH FOR HARPOON.

Made for the harpoons with fixed heads. Wood, covered with canvas, painted black. Length, 7 inches. 56402. U. S. Fish Commission.

SHEATH FOR TOGGLE-IRONS.

A kind of sheath for the toggle-iron, usually made at sea, to prevent the heads of the harpoons from rusting, and from inflicting flesh-wounds upon the men when handling them. Common to all whaling vessels. Length, 10 inches. New Bedford, Massachusetts, 1882. 56400 and 56401. Gift of I. H. Bartlett & Sons.

WHALING-GUNS.

ORDNANCE.

SWIVEL-GUNS.

Barrel, stub-twist; stock, hard wood; guide for taking aim, brass, extending along and screwed to barrel; elevated at rear end. Barrel fastened to stock by bolts and lugs. Breech-plug chambered and screwed into the barrel. Two nipples. Flash-pan, brass, hinged to rear of elevated sight. Barrel stamped "W. Greener, maker, Birmingham, 1853." Length, 51 inches; weight, 56 pounds. New Bedford, Massachusetts, 1882. 56342; ramrod, 56343; swivel, 56344; gun-strap, 56345; wrench, 56346. U. S. Fish Commission. Mounted on a swivel which is inserted in a loggerhead made fast to the clumsy-cleat in the bow of the boat, and used in discharging gun-harpoons and ex-

SWIVEL-GUNS—Continued.

plosive lances for fastening to and killing whales. When cocked, the hammer is held stationary by a small iron pin inserted in a hole in the stock, as a precaution against premature discharge. The gunner having taken aim at a whale, at the opportune moment removes the pin and fires the gun by means of a laniard fastened to a hair-trigger.

SMALL-ARMS.

SHOULDER-GUNS—MUZZLE-LOADING.

BRAND GUN, No. 1.

Barrel, cast-steel; front part of barrel round. Elongated thimble for ramrod. Ramrod, hickory, with brass thimble and screw. Skeleton stock, iron, screwed to barrel. Guard-plate, steel. Rigid eye for laniard. Laniard attached. Patent breech. Stock and barrel "blued." Length, 38 inches; weight, 23 pounds. Norwich, Connecticut, 1883. 56336. Gift of Junius A. Brand. Three drachms of powder ("Sea-shooting, F. F. G.") is recommended as a charge for shooting a bomb-lance.

BRAND GUN, No, 2.

Barrel, cast-steel; front part of barrel round. Ramrod, hickory. Skeleton stock, iron. Guard-plate, steel. Rigid eye for laniard. Patent breech. Stock and barrel "browned." Length, 36 inches; weight, 19½ pounds. Norwich, Connecticut, 1876. 24986. Gift of C. C. Brand. Used with C. C. Brand's improved bomb-lance: 24989—wad-cutter (inside); 24992—prepared wads; 24990, 24991, screw-drivers. Three drachms of powder (Sea-shooting, F. F. G.) is recommended by the manufacturer as a charge for shooting a bomb-lance.

SHOULDER-GUN WITH BRASS STOCK.

Barrel, cast-steel, octagonal. Rear and front sights. Two thimbles for ramrod. Ramrod, hickory, with brass thimble and double worm-screw. Underside of barrel grooved, for ramrod. Stock, gun-metal, cast with breech-plug and rigid eye for laniard. Grip wrapped with marline. Lock, common percussion. Length, 35½ inches; weight, 28 pounds. New Bedford, Massachusetts, 1882. 56335. Gift of William Phillips & Son. These guns were formerly used, but very little is known of their history.

SHOULDER-GUN WITH WOODEN STOCK.

Barrel, smooth-bored, cast steel. Hind and fore sights. Patent breech. Stock, walnut. Mountings, steel and brass. Rigid eye on underside of stock for laniard. Percussion lock. Guard-plate, steel. Length, 38½ inches; weight, 25 pounds. New

SHOULDER-GUN WITH WOODEN STOCK—Continued.

Bedford, Massachusetts, 1882. 56340. U. S. Fish Commission. Not used at present; formerly employed in connection with gun-harpoons and bomb-lances.

BROWN'S WHALING-GUN.

Stock, barrel, and guard-plate, gun-metal; trigger-guard fastened to stock with three screws; rigid eye on trigger-guard for laniard; front and rear sights; breech-plug cast with stock; stock recessed for two nipples; stock and barrel connected by a screw-joint; muzzle reinforced with a gun-metal band. Stamped "Robert Brown, New London, Connecticut." Length, 46 inches; weight, 36 pounds. New Bedford, Massachusetts, 1882. 56341. U. S. Fish Commission. A kind of gun formerly used for projecting gun-harpoons. Charged with ordinary powder and discharged from the shoulder. Not used at present.

BROWN'S GUN (short).

Stock, barrel, and trigger-guard, gun-metal. Stock screwed to barrel by means of permanent breech-plug cast with the stock. Small eye cast with trigger-guard for laniard. Laniard, lance-warp. Copper band at muzzle. Length, 36¼ inches; weight, 33 pounds. New London, Connecticut, 1882. 56339. Gift of Messrs. Lawrence & Co. Stamped "C. A." and supposed, from its resemblance in almost every detail to the Brown gun, with the exception of the length of the barrel, that it may have been manufactured by Robert Brown, New London, Connecticut. Not used at present.

RIFLED WHALING-GUN.

Barrel, cast steel, nine grooves; stock, walnut; rigid eye for laniard. Length, 38 inches; weight, 18 pounds. New Bedford, Massachusetts, 1882. 56338. Gift of Edward P. Haskell, jr. Manufactured by Grudchos & Eggers, New Bedford, Massachusetts. This kind of gun was formerly used, to a limited extent, however, by American whalemen, but has been supplanted by the more recently improved patterns, the principal objection being the rifled barrel. Aside from the trouble and delay occasioned by a foul barrel, it was found impossible to use any other lances than those made especially for it. Some of these rifles have been transformed into the class of guns known as "smooth-bores" by removing the grooves; but they were not regarded with much favor, and the manufacture of rifled guns for whaling has virtually ceased. Kentucky rifle powder, F. F. G., was used, the amount for each load being graduated by the "charger" of the flask furnished with the gun.

BREECH-LOADING GUNS.

PIERCE AND EGGERS' GUN.

One of the latest improved shoulder-guns, used in connection with the Pierce and Brand explosive lances. Skeleton stock. Stock, barrel, breech-block, and trigger, gun-metal; barrel reinforced. The gun is loaded by inserting a cartridge—Winchester No. 8, central fire—in the breech, and the lance in the muzzle, and discharged as an ordinary shot-gun, the cartridge being ignited by a firing-pin striking a percussion-cap. Length, 36½ inches. Weight, 24 pounds. New Bedford, Massachusetts, 1882. 56337; cartridge-holder, 56347; cartridge-primer, 56348; cartridge 56349; charger, 56350; wads, 56351; gun-stick, 56344. Deposited in part by the U. S. Fish Commission and S. Eggers, Sr. Patented February 12, 1878, by Eben Pierce and S. Eggers, Sr. Manufactured by S. Eggers, New Bedford, Massachusetts. The gun in its present condition is the same as when used by whalemen.

CUNNINGHAM AND COGAN'S GUN.

Skeleton stock, cast iron, painted black; stock and breech-piece cast in one piece, with a small rigid eye at rear of guard-plate for laniard; barrel, steel, reinforced and screwed to the stock; breech-block, containing firing-pin, hinged to stock, and, when closed, held by a snap-spring; central-fire cartridge. Length, 33 inches. Weight, 27 pounds. New Bedford, Massachusetts, 1882. 56334. Gift of William Lewis. Patented by H. W. Chapman, Newark, New Jersey, May 15, 1877, and manufactured by Patrick Cunningham, New Bedford, Massachusetts. Used principally by the crews of the steam barks in the Arctic regions; discharges Cunningham & Cogan's explosive lance. This is the form commonly in use, and was selected from a lot about to be sent to a whaling-vessel.

DARTING-GUNS.

PIERCE'S DARTING-GUN (old).

Breech, brass, cast with breech-piece. Barrel, steel, screwed to breech-piece. Rear end of the gun terminates in a conical socket, into which may be fitted the pole or handle. A vertical slot is cut through the breech for the reception of the hammer, which was pivoted and retained in its firing position by the rod or trigger. Hammer, wanting. Trigger projects over the muzzle, and moves freely back and forth in a guide near the end of the barrel. A sleeve of metal, or other suitable material, was intended to fit over the breech, or lock-case, to render it water-tight. The harpoon is of the pattern known as the "Temple-gig." Toggle, malleable cast iron, pivoted in

PIERCE'S DARTING-GUN (old)—Continued.

the cheeks of the forward end of the shank. Shank composed of two pieces of conjoined iron: First half, wrought iron, slotted near its rear end for the iron arm with rigid eye to which the iron-strap should be made fast, and provided with a female screw in a recess in the rear end. Rear part of shank cast, and screwed to the forward half of the shank. Length of gun, 17½ inches; length of trigger, 27½ inches; length of gun-harpoon, 23¼ inches. Provincetown, Massachusetts, 1882. Gun, 56331; harpoon, 56441. Presented by Mr. Seth Smith. The gun having been charged with ordinary powder and the iron inserted, it is darted and automatically discharged by the long wire trigger coming in contact with the whale. An imperfect model of the first darting-gun with gun-harpoon, invented by Capt. Eben Pierce, August 22, 1865. Not used at present.

PIERCE'S MUZZLE-LOADING DARTING-GUN.

Old style, with pole, harpoon, and darting-bomb; muzzle-loading. Gun: barrel, lock-case, socket for pole, socket pieces or lugs for harpoon, and one forward guide for trigger, gun metal; two after-guides for trigger, brass; bottom of lock-case, brass, soldered; firing-pin and trunnion, brass; lock-case (cover for excluding moisture), leather with brass catch. Hammer, concealed in lock-case, gun-metal. Trigger, projecting beyond muzzle, steel rod. Harpoon, common toggle-iron; rear end made to fit socket-pieces on the muzzle of the gun, and provided with a projecting eye, in which the iron-strap is made fast. Toggle branded "Macy" (Manufacturer). Length of gun, 19¾ inches; length of pole, 56¼ inches; length of trigger, 34 inches; length of harpoon, 30 inches; length of darting-bomb, 15½ inches. New Bedford, Massachusetts, 1876. 25252. U. S. Fish Commission. Patented and manufactured by Capt. Eben Pierce, New Bedford, Massachusetts. Stock number 476.

CUNNINGHAM'S DARTING-GUN.

Breech-loading hinge gun, with harpoon, strap, and bomb-lance. Gun: barrel, socket, breech-snap, hinge, and lugs, gun-metal; trigger, steel rod, projecting beyond the muzzle. Lance and cartridge combined. Harpoon, common toggle-iron; two barbs on the toggle; mortised head; rear end of shank made to fit the lugs of the gun. Eye for rope-strap. Toggle branded "J. A. S." (John A. Sawyer, manufacturer). Iron-strap, whale-line; one end of strap bent into the eye of harpoon and the other provided with an eye-splice into which one end of the whale-line is intended to be fastened. Length of gun, 15½

CUNNINGHAM'S DARTING-GUN—Continued.

inches; length of trigger, 21 inches; length of harpoon, 34 inches; length of strap, 64 inches. New Bedford, Massachusetts, 1882. Gun, 56332; harpoon, 56352; lance, 56333; iron-strap, 56353. U. S. Fish Commission. Patented (1882) and manufactured by Patrick Cunningham, New Bedford, Massachusetts. Stock number of gun, 107.

RECHTEN'S DARTING-GUN.

Gun, and guides for trigger, cast in one piece, gun-metal. Trigger, or sliding-rod, cast-steel, with a spiral brass cushion-spring. The lock-portions are concealed within the stock and protected from exposure by a hinged cover, which, when closed, fastens with a snap-spring. Stamped on breech "Patd. Dec. 7th, 1869;" stamped on barrel, monogram "J. P. R.," and stamped on sliding-rod, or trigger, "F. Hobson; warranted Sheffield cast-steel." Harpoon consists of a double-barbed fixed head; a short neck with an eye in its center, to which is welded a loose link with an eye in the rear for the iron-strap. The gun may be thrust by hand and the harpoon automatically discharged into the whale by impact. Length of gun, $9\frac{3}{4}$ inches; length of harpoon, including link, $11\frac{1}{4}$ inches. New Bedford, Massachusetts, 1882. 56330. U. S. Fish Commission. An imperfect model of a kind of darting-gun patented by John P. Rechten, of New York, N. Y., December 7, 1869. Not in use.

BURSTED BARREL OF A WHALEMAN'S DARTING-GUN.

Barrel of a darting-gun fractured by premature explosion of a bomb-lance when darted at a whale. Brought home by a whaleman as an interesting "curio." Portion of hickory pole in the socket. Length, 10 inches. New Bedford, Massachusetts, 1882. 56328. Gift of Jonathan Bourne.

MODEL OF DARTING GUN.

Said to be the original model of the first breech-loading darting-gun. Wood, in two sections. Hammer, wood, operated by a small piece of wire and a steel spring. Length, 16 inches. New Bedford, Massachusetts, 1882. 56329. Gift of Patrick Cunningham. Made by a whaleman on board ship in the Arctic regions. Scrimshaw work.

ROCKET GUNS.

ROCKET GUN.

A stockless gun with a barrel of such shape and proportion as to balance on the shoulder of the gunner; designed to throw large rockets and shells; barrel, sheet-copper, cylindrical; two rods project behind the barrel and are fastened to an iron plate; barrel encircled with two wide transverse flanges, the lower one

ROCKET-GUN—Continued.

fixed, and the upper one hinged in such a manner that when the gunner is taking aim it lies parallel to the barrel, but is thrown up vertically by the action of the rocket to protect the gunner from the "backfire" of the rocket. The gun is discharged by firing the pistol through a hole made in the stock into the rocket. U. S. Fish Commission. 56327. Patented January 22, 1861, by Thomas W. Roys, of Southampton, New York. Employed principally in whaling off the Northwest coast. Successfully used from the decks of steamers, for which it was designed.

WHALEMAN'S LANCES.

THRUST BY HAND.

EXPLOSIVE.

KELLEHER'S HAND BOMB-LANCE.

Consists of a lance-head, a tubular magazine, and the ordinary harpoon shank, secured to a white-ash handle. A sliding clamp attached to a wire by impact explodes the bomb by means of a common friction-primer, such as is used for discharging pieces of artillery. Socket served with marline to prevent iron-rust. Lance-strap spliced around the socket, seized to the handle in three places, and projecting through a hole at the butt. Length of lance and shank, 48¼ inches; length of pole, 70 inches. New Bedford, Massachusetts, 1882. 56359. Gift of Daniel Kelleher. (Patented by Daniel Kelleher March 26, 1878.) This instrument may be used as an explosive or non-explosive hand-lance. As there is no "backward kick," or recoil, the operator grasps the handle when the lance explodes.

NON-EXPLOSIVE.

HAND-LANCE.

A kind of lance with a short wide blade, formerly used for killing whales. Superseded by the explosive lance. Length, 68 inches. New Bedford, Massachusetts, 1876. 25611. Presented by W. H. Cook & Co. Primitive model used by the New Bedford whalemen.

HAND-LANCE.

A nickel-plated hand-lance used in giving the death-wound. Length, 5 feet 9 inches. Fairhaven, Massachusetts, 1882. 56357. Manufactured and presented by Luther Cole.

HAND-LANCE.

A kind of lance formerly relied upon altogether for killing whales. Length, 5 feet 3 inches. New Bedford, Massachusetts. 56389. Gift of James Barton. Manipulated by the officer of the boat.

HAND-LANCE.

Head, cast steel; shank and socket, wrought iron. Handle, wood. New. Total length, 13 feet. Fairhaven, Massachusetts, 1883. 56418. U.S. Fish Commission. Formerly extensively used for killing the whale. Stamped "Luther Cole" (Manufacturer.)

HAND-LANCE AND POLE.

Head, cast steel; shank and socket, wrought iron. Handle, wood. New. Total length, 13 feet. Fairhaven, Massachusetts, 1883. 56418. U. S. Fish Commission. Formerly extensively used for killing the whale. Stamped "Luther Cole" (Manufacturer.) Rigged for use.

SEAL, SEA-ELEPHANT, AND WALRUS LANCES.

THRUST BY HAND.

SEAL-LANCE.

Long head; diamond point; common shank and socket. Manufactured by James Barton for the New London sealers. New. Length, 32½ inches. New Bedford, Massachusetts, 1882. 56366. U. S. Fish Commission.

SEAL-LANCE.

A kind of lance with a short shank which may be used in killing seal, sea elephant, or walrus. Socket with an extended sleeve. Length, 28½ inches. New Bedford, Massachusetts, 1883. 56367. Gift of Luom Snow & Son. Old. Has been used.

SEAL-LANCE.

A kind of lance which may be used for killing seal, sea elephant, or walrus. Spoon-shaped head, and extended sleeve on socket. Used by New Bedford sealers. Length, 24 inches. New Bedford, Massachusetts, 1883. 56368. Gift of Luom Snow & Son. Old. Obtained from a New Bedford sealing vessel.

SEAL-LANCE.

A kind of lance which may be used for killing seal, sea elephant, or walrus. Socket with extended sleeve. Section of pole attached. Length, 24 inches. New London, Connecticut, 1882. 56369. Gift of Lawrence & Co. Old. Has been used. Obtained from a New London sealer.

LANCES FOR STOPPING RUNNING WHALES.

FLUKE-LANCE.

A kind of lance intended to take the place of the thick boat-spade. Manufactured to gratify a whim of a whaleman. None in use. Length, 5 feet. New Bedford, Massachusetts, 1882. 56358. Gift of James D. Driggs, manufacturer.

EXPLOSIVE LANCES.

PROJECTED FROM GUNS.

ALLEN'S BOMB-LANCE.

An example of the first patented bomb-lance used by American whalemen, for which letters patent were granted Oliver Allen, Norwich, Connecticut, September 19, 1846. (U. S. Patent Office, No. 4764.) Rare. Familiarly known to whalemen as the "Broomstick lance." Length, 42 inches. Nantucket, Massachusetts, 1882. 56372. Gift of Joseph B. Macy. The instrument consists of a steel lance-head joined by a closely-fitting tenon to a cylindrical bomb which is composed of a piece of iron piping; a neck of smaller diameter than the bomb, brazed to rear of bomb, and a long tubular shank, wood, confined to the rear end of neck with a brass ferule. The rear end of the shank terminates in a small metal button through the axis of which a small aperture is made. The time-fuse, inclosed in the tubular shank, is ignited by the flash of the discharge of the gun, which passes through the vent hole of the metal button.

BRAND'S BOMB-LANCE NO. 1 (OLD MODEL).

Primarily intended to be used with Brand's No. 1 gun. Patented in 1852 by C. C. Brand. Length, $16\frac{3}{4}$ inches. Norwich, Connecticut, 1883. 56388. Manufactured and presented by Junius A. Brand.

BRAND'S BOMB-LANCE NO. 1 (SHORT).

May be used with Brand's No. 1 Muzzle-loading gun, Pierce & Eggers' Breech-loader, or Pierce's Darting-gun. New model. Patented in 1879. Length, $16\frac{3}{4}$ inches. Norwich, Connecticut, 1883. 56387. Patented, manufactured, and presented by Junius A. Brand.

BRAND'S BOMB-LANCE NO. 1 (LONG).

May be used with Brand's No. 1 Shoulder-gun, the Pierce & Eggers' Breech-loading gun, or the Pierce Darting-gun. New model. Patented in 1879. Length, $18\frac{3}{4}$ inches. Norwich, Connecticut, 1883. 56386. Patented, manufactured, and presented by Junius A. Brand.

BRAND'S BOMB-LANCE NO. 2.

Used with Brand's No. 2 Shoulder-gun. Old model. Patented in 1852 by C. C. Brand. Length, $21\frac{1}{2}$ inches. Norwich, Connecticut, 1883. 56384. Manufactured and presented by Junius A. Brand.

BRAND'S BOMB-LANCE No. 2.

Used with Brand's No. 2 Shoulder-gun. New model. Patented in 1879. Length, 21¼ inches. Norwich, Connecticut, 1883. 56385. Patented, manufactured, and presented by Junius A. Brand.

BRAND'S BOMB-LANCE No. 3.

Used with Brand's No. 2 Shoulder-gun. Old model. Patented in 1852 by C. C. Brand. Length, 24 inches. Norwich, Connecticut, 1883. 56382. Manufactured and presented by Junius A. Brand.

BRAND'S BOMB-LANCE No. 3.

Used in connection with Brand's No. 3 Shoulder-gun. New model. Patented in 1879. Not much used at present. Length, 24 inches. Norwich, Connecticut, 1883. 56383. Patented, manufactured, and presented by Junius A. Brand.

BRAND'S BOMB-LANCE No. 4.

Used in connection with Greener's swivel-gun. New model. Patented in 1879. Length, 34 inches. Norwich, Connecticut, 1883. 56381. Patented, manufactured, and presented by Junius A. Brand.

PIERCE'S BOMB-LANCE.

Main portion, or powder chamber, brass tubing; anterior end provided with nipple for percussion-cap and time-fuse. Rear end or tail-piece, composition metal; fluted sides with longitudinal slots for reception of the wings. Guide-wings, sheet-brass, fastened to brass wires; closed by a brass ring when placed in the gun, and expand radially from a common center when discharged. Lance-point, composition metal; four cutting edges; recessed, containing a hammer secured by a wooden pin, which is broken by the concussion of the explosion of the charge, and explodes the cap on the nipple in the end of the shank, communicating the fire to the magazine by means of the time-fuse. Button, sole leather, fastened with a screw. Length, 19 inches. New Bedford, Massachusetts, 1882. 56355. Manufactured and presented by Captain Eben Pierce. Used with Pierce & Eggers' Shoulder-gun. Made in three sections. The lance is loaded by detaching the rear section, and capped by detaching the cutting-point.

CUNNINGHAM & COGAN'S BOMB-LANCE.

An improved bumb (with rubber feathers) and cartridge combined, used in connection with Cunningham & Cogan's breech-loading gun, patented December 28, 1875. Length, 16¼ inches. New Bedford, Massachusetts, 1882. 56371. Gift of William Lewis. (Patented and manufactured by Patrick Cunningham).

GRUDCHOS & EGGER'S BOMB-LANCE.

A kind of lance invented and Manufactured by Julius Grudchos & Selmar Eggers, of New Bedford, Massachusetts, to be used in connection with the rifled gun. It was an experiment, ended in failure, and has been abandoned. Length, 15½ inches. New Bedford, Massachusetts, 1882. 56378–9. Gift of Frederick S. Allen. Patented May 26, 1857. Head or blade, steel; lanceolate. Shank forming the magazine, iron tubing. Rear section contains the mechanical contrivances for exploding the bomb. Extreme rear end terminates in a butt, technically termed a "ball," made of lead, with spiral elevations to fit the grooves of the rifle, thereby giving the lance, when discharged from the gun, a rotary motion to prevent it striking sidewise. A groove is made around the ball for the reception of oiled yarn, which is intended as a wadding, as well as for cleaning the rifle. Trigger pivoted at one end in a slot near the extremity of the instrument. The trigger remains in repose, parallel to the shank, when the lance is placed in the barrel; but upon entering the whale it is elevated to an angle of about 40 degrees by the resistance of the flesh and automatically explodes the lance by striking a percussion-cap.

EXPLOSIVE GUN-LANCE.

A kind of explosive lance, the record of which is very little known. Consists of two conjoined parts; the forward half, or magazine, malleable iron, cast with the head, which has four cutting edges; the rear section, or fuse-shaft, cast iron, fluted on three sides for the ropes (which are placed in the gun with the lance), and attached to the bomb with a screw-joint. The rear extremity of the fluted elevations is perforated with three holes through which the strands of rope are rove and braided. Time-fuse inclosed in fluted tubular shank. Cork shoe, or button. Length, 33 inches. Fairhaven, Massachusetts, 1882. 56380. Gift of Luther Cole. As the lance has no barbs, it is evident that the braided rope-tails (which were of a uniform size and so systematically arranged round the axis of the shank) were intended to act in the capacity of wings, by dragging behind the lance with equal force to keep it in a true course during its flight.

EXPLOSIVE LANCES RECOVERED FROM WHALES.

BRAND'S LANCE, No. 1.

Old, not exploded. Cut from a dead whale. Wings burned by the flash of the gun. Length 16 inches. Edgartown, Massachusetts, 1882. 56361. Gift of C. B. Marchant.

BRAND'S LANCE, No. 2.

Old, not exploded. Cut from a dead whale. Rubber wings scorched by the discharge of the gun. Length, 21 inches. Edgartown, Massachusetts, 1882. 56360. Gift of C. B. Marchant.

SERIES OF EXPLODED BOMB-LANCES CUT FROM DEAD WHALES.

Three with rubber wings, and one with metal wings. Fragmentary pieces. New Bedford, Massachusetts, 1882. 56362–'3–'4–'5. Gift of Patrick Cunningham.

NON-EXPLOSIVE LANCES.

PROJECTED FROM GUNS.

GHENN'S LANCE.

Stock, wood, slotted longitudinally the entire length for the reception of a small line, one end of which is made fast to the butt; the other has an eye-splice for bending on the lance-warp. This line, or "lance-strap," having been placed in the longitudinal slot, a strip of paper is pasted over it to hold it in a proper position when loaded in the gun. The rear end of the shank is slotted through the wood to form receptacles for the wings. The wings, two in number, are made of tin soldered to wires, which latter act as springs to compress the wings when placed in the gun-barrel, and to elevate them radially when the instrument is projected. The head, or cutting-point, resembles in shape that of the old double-barbed hand-harpoon, but is smaller; barbs slightly recurved; short neck, terminating in a socket for the reception of the forward end of the wooden shank and strengthened by a lead ferule. Length, $23\frac{1}{4}$ inches. Provincetown, Massachusetts, 1882. 56356. Gift of Seth Smith. One of the original models. Manufactured and used, to a limited extent, by Captain Josiah Ghenn, of Provincetown, Massachusetts. In about 1849 Captain Ghenn made several of these lances to be fired from a shoulder-gun into the whale after it had been harpooned; but, upon being notified that this pattern was an infringement on C. C. Brand's patent, he discontinued their manufacture.

BROWN'S NON-EXPLOSIVE GUN-LANCE.

Head double-barbed, fixed, with lanceolate blades. Entire head cast iron (case-hardened). Shank, cast iron, flat and fluted on both sides for the reception of rope-tails, which are intended to be used as wings. Eye in the rear end of shaft. Button wanting. Detachable button. Length, $36\frac{1}{4}$ inches. New Bedford, Massachusetts, 1882. 56217. Gift of Thomas Knowles & Co. Patented by Robert Brown, New London, Connecticut, August 20, 1850. Not used at present.

DARTING-BOMBS.

PIERCE'S DARTING-BOMB.

A kind of explosive lance known as the "darting-bomb," used in connection with the darting-gun for killing whales. Patented and manufactured by Capt. Eben Pierce. Length, 15½ inches. New Bedford, Massachusetts, 1876. 25252. U. S. Fish Commission. Substantially the same as the other kind of the Pierce lance, with the exception that, as it is projected when the muzzle of the gun is in contact with the whale, the wings are considered superfluous, and are not used on this pattern.

BRAND'S DARTING-BOMB.

A kind of explosive lance used in connection with Pierce's darting-gun. Length, 14 inches. Norwich, Connecticut, 1883. 56377. Patented, manufactured, and presented by Mr. Junius A. Brand. Substantially the same as the other kinds of Brand's lances, with the exception that, as it is driven into the whale when the gun is darted by hand, wings are not used.

ROCKETS.

ROCKET AND BOMB-SHELL.

Used in connection with the rocket-gun. This projectile consists of a cast-iron shell with three cutting edges, a brass rocket-shell, and an iron loop-extension screwed to rear of the rocket. The bomb and rocket are intended to be connected with a breech-piece. The shell has been detached to show the toggle, which is fastened by two links to the projecting end, or shoulder, of the rocket, and, when used, is entirely inclosed in the body of the shell. When the bomb explodes the toggle and chain are released, and become fastened in the blubber or flesh, preventing the apparatus from being withdrawn. An iron link or loop, with two arms, is adjusted to the loop-extension, or double shank. The end of the iron-strap is made fast to this link. Length of shank and rocket, 66 inches; length of toggle, 9¾ inches; length of bomb, 15¼ inches; shank, rocket, and toggle, 56373; bomb, 56374; iron-strap, 56375. The bomb may be loaded with an explosive compound which is ignited by the rocket-shell. The fire is communicated to the combustible material in the rocket-chamber by means of a pistol attached to the gun. The issue of gas from the rear of the rocket propels the apparatus.

APPARATUS FOR MANIPULATING DEAD WHALES, CUTTING OFF THE BLUBBER, BOARDING, MINCING, AND TRYING-OUT.

BLUBBER TACKLE.

ROPES AND BLOCKS FORMING A PURCHASE FOR HOISTING IN THE BLUBBER.

CUTTING-BLOCKS.

Two upper blocks, one guy-block, and one lower block. Lower block *strapped* with rope. The earliest method adopted for "strapping" the lower block, and in use at present on the majority of the vessels, but has been done away with on others by the improved chain strap; when used the rope strap with eye, or "grommet," is passed through a hole cut for the purpose in the blubber, and made fast (toggled) with the blubber-fid, which is inserted in the eye, thus fastening the blubber to the cutting-tackle by means of which it is hoisted on board. Lower block 18 by 12 by 10 inches; upper blocks 18 by 12 by 6 inches; guy-block, 13 by 9 by 6 inches. New Bedford, Massachusetts, 1876. 56861. E. B. & F. Macy. Total weight of blocks, hook, and toggle, 231 pounds.

CUTTING-FALLS.

Manila. Rove through upper and lower blocks. Length, 23 fathoms. Washington, D. C. 51712. U. S. Fish Commission.

WHALEMAN'S HOOKS.

USED IN BOAT.

BOAT-HOOK.

Hook round bend, with projecting spur. Length, 8 feet. New Bedford, Massachusetts, 1876. 25614. Gift of Humphrey S. Kirby Used in the whale-boat as an ordinary hook of this kind.

USED ON VESSEL.

LINE-HOOK.

Iron shank with four branching round bend hooks, and spruce pole. Length, 15 feet. New Bedford, Massachusetts, 1876. 25924. Gift of E. B. & F. Macy. An implement carried on a whaling-vessel, and used principally from the deck for taking the end of the tow-line from the hands of the officer of the boat, in order that the whale may be hauled alongside and made fast.

LARGE BOAT-HOOK.

Hook round bend, with projecting spur, and large socket with sleeve, for pole. Length, 14 feet $6\frac{1}{2}$ inches. Fairhaven, Massachusetts, 1883. 56424. U. S. Fish Commission. Used from the vessel when cutting-in a whale for hauling upon and

LARGE BOAT-HOOK—Continued.

removing the lines from the harpoons which are fastened to the whale. As much of the tow-line as can be saved in this way is subsequently used for making iron-straps, warps, &c.

LARGE-RING BOAT-HOOK.

Hook, iron, round bend, barbless. Projecting iron spur. Socket with extended sleeve. Pole, spruce; small iron ring for bending on a rope. Total length, 15 feet 7 inches. New Bedford, Massachusetts, 1876. 25926. Gift of E. B. & F. Macy. An implement used on a whaling-vessel when cutting-in a whale for pressing upon the *back* of the blubber-hook to direct the point into the hole made in the blubber of the first blanket-piece, and for hauling pieces of blubber about deck.

LARGE BLUBBER-HOOK.

Made in blacksmith shop of best refined iron. Loose ring for shackling to block. When used a rope is bent into the small ring at the *heel* of the hook, by which one of the officers directs the point into the hole cut into the blubber. A small hook, used probably on a schooner. A large and stiff ship would need a much larger and stronger hook, as the hooks are sometimes broken. Length, 26 inches. New Bedford, Massachusetts, 1876. 56861. E. B. & F. Macy. The blubber-hook is used principally for raising the blanket-piece, which is the initial point for stripping off the blubber. The pectoral fin and *head* of blanket-piece having been hoisted up "two blocks," and the first piece boarded, the hook is detached from the block, and the strap and toggle, if a *rope strap*, or the chain alone, if a *chain strap*, used in hoisting in the balance of the blubber. (*Vide* Blubber Tackle.)

SMALL BLUBBER-HOOK.

A kind of a "roustabout" hook not in general use, but may be employed in handling blanket-pieces in the hold of the vessel, in clearing the hatch when blocked with blubber, as well as in hauling the junk aft when it is to be *lashed;* hence the name "junk-hook," which is sometimes applied. Iron; small iron ring for bending on a rope when hanling the blubber. Length, 9 inches. 57725. New Bedford, Massachusetts, 1882. U. S. Fish Commission. Also known as the "lip-hook," and used by some right-whalemen for *hooking up* the lip of the whale when about to reeve the main line for "towing-in."

FIN-CHAIN HOOK.

A kind of hook, familiarly known as the "lobster claw," from its resemblance to the claw of the lobster; "fin-chain hook" from

FIN-CHAIN HOOK—Continued.

the manner in which it is used, and "ring-hook," from the peculiar shape of the bend. Large ring for shackling to lower cutting-block; small ring at *back* of hook for a laniard by means of which the hook is guided or "pointed" in the direction required. Length, 15 inches. Weight, 32 pounds. New Bedford, Massachusetts, 1882. 57726. U. S. Fish Commission. Some whalemen prefer it for *hooking* into the fin-chain, and it may, in fact, be used as an ordinary blubber-hook. It is capable of withstanding great *strains*, and its peculiar ring-shaped bend affords a tenacious *grip*.

FLUKER.

Slender spruce pole and a conjoined condemned lance shank and socket, the shank being bent, forming a round bend, until its point is directly opposite the socket. Rare. Length, 11 feet. New Bedford, Massachusetts, 1882. 55817. U. S. Fish Commission. An implement used on a whaling-vessel for passing a rope attached to one end of the fluke-chain around the *small* for fastening the whale to the ship prior to cutting off the blubber, the process being known as "fluking a whale." Obtained from the whaling brig "Varnum H. Hill," of New Bedford, Massachusetts. Manufactured at sea.

HOOKS USED IN CUTTING BLACKFISH.

BLACKFISH BLUBBER-HOOK.

A long, slender hook, with a broad tread in bend and a stiff eye. Used at sea for removing the blubber from blackfish. Provincetown, Massachusetts, 1882. 57705. U. S. Fish Commission.

WHALEMAN'S SPADES.

SCARFING AND LEANING.

NARROW CUTTING-SPADE.

Blade, cast-steel; short shank and socket, wrought-iron. Pole, spruce. Length, 15 feet. New Bedford, Massachusetts, 1876. 25928. Gift of E. B. & F. Macy. The smallest spade used when cutting-in a whale, for what is technically termed *scarfing*. Also known as the *thin boat-spade*.

NARROW CUTTING-SPADE.

Head, steel. Shank and socket, wrought iron. Nickel-plated. New. Total length, 12 feet, four inches. Fairhaven, Massachusetts, 1882. 55808. Manufactured and presented by Luther Cole. Used for *scarfing* (cutting the blubber into helical strips).

WIDE CUTTING-SPADE.

Head, cast steel; socket, wrought iron. Pole, wood. Blade has curved edge. Rare. Total length, 15 feet 6 inches. New Bedford, Massachusetts, 1876. 25008. Gift of J. H. Thomson. A kind of spade used for "leaning-up," that is, severing the pieces of flesh which adhere to the blubber when cutting-in a whale.

MORTICING HOLES IN BLUBBER.

HALF-ROUND SPADE.

Blade, in the shape of a gouge, cast-steel; shank, wrought iron. Pole, spruce. Length of spade, 15½ inches. Length of spade and handle, 15 feet 4 inches. New Bedford, Massachusetts, 1876. 25927. Gift of E. B. and F. Macy. The half-round spade is used by sperm-whalemen for making a large hole in the blubber for the blubber-hook. It is also used, though seldom, from the waist of the vessel, for making the holes in the blanket-piece which are used in fastening the blubber to the cutting-tackle.

DECAPITATING THE WHALE.

HEAD-SPADE WITH WOODEN HANDLE.

Large, heavy head, cast-steel; strong wrought-iron shank, 1⅛ inches in diameter, with socket and sleeve riveted in three places to a stout wooden handle. Total length 10 feet. New Bedford, Massachusetts, 1882. 55813. Gift of Jonathan Bourne. Used for cutting through the bone when decapitating the whale.

IRON HEAD-SPADE.

A very heavy head-spade with steel head; wrought-iron handle served with spun-yarn, with a rigid eye in extreme end for a rope. Length 10 feet 10 inches. New Bedford, Massachustts, 1882. 55867. Gift of Jonathan Bourne. Rare; usually wooden poles. Employed in cutting the head-bone when decapitating the whale.

CUTTING SLIVERS.

SLIVER SPADE.

The widest *cutting-in* spade used by whalemen. Blade, cast-steel; short shank with socket and wooden handle. Length of spade 21 inches. Total length, including handle, 13 feet 7½ inches. Provincetown, Massachusetts, 1882. 55805. U. S. Fish Commission. A kind of spade used when cutting off the head of a whale for severing the connecting pieces of flesh, which are technically termed "slivers." It may also be used as a blubber-room spade by inserting a shorter handle.

CUTTING OUT THROAT-BONE, ETC.

THROAT-SPADE.

Head, or blade, cast steel; shank and socket, wrought iron. Shank round. Pole, spruce. Total length, 15 feet. New Bedford, Massachusetts, 1876. 25925. Gift of E. B. & F. Macy. A spade used for cutting a passage for the *head-strap*, in order that the head of the right whale, or bowhead whale, may be hoisted on deck, and for getting out the throat-bone (baleen). This kind of spade may be made with a round or flat shank, which should bend easily.

CUTTING BLUBBER ON DECK AND IN THE BLUBBER-ROOM.

WHALEMAN'S DECK-SPADE.

Blade, cast steel; handle, spruce. Length, 6 feet. New Bedford, Massachusetts, 1882. 57701. Gift of Thomas Knowles & Co. May be used with its present handle for cutting up blubber on deck when the main hatch is blocked, and with a longer handle as a *pot-spade* for "spading pots," to prevent refuse pieces adhering to the sides and bottoms of the pots when trying-out oil.

BLUBBER-ROOM SPADE.

Blade, cast steel; short shank, with socket for handle. Handle, wood, with cross-piece at upper end. Total length, 3 feet 11 inches. Width of blade, 7½ inches. New Bedford, Massachusetts, 1876. 57700. U. S. Fish Commission. A wide spade used in the blubber-room for reducing the blanket-pieces to horse-pieces prior to rendering the oil.

TOWING THE WHALE.

REEVING TOW-ROPE THROUGH THE LIPS.

THICK BOAT-SPADE.

Head, cast-steel; shank and socket, wrought iron. Pole, wood. New. Nickle-plated. Length, 12 feet. Fairhaven, Massachusetts, 1882. 55810. Manufactured and presented by Luther Cole. Carried in the boat, and used for making holes in the lips of the whale for reeving the tow-rope. Formerly used for stopping a running whale by severing the tendons at the junction of the caudal fin and body.

AXES.

DECAPITATING THE WHALE.

HEAD-AXE.

Common axe used by boatsteerers in cutting the bone when decapitating a whale. Length, 32½ inches. New Bedford, Massachusetts, 1876. 25913. Gift of E. B. & F. Macy. Sometimes used instead of the head-spade, in smooth weather.

CHAINS.

HOISTING IN BLUBBER.

FIN-CHAIN.

Heavy chain with large triangular loose link, or "ring" at one end, and small "ring" at the other. Length, 15 feet. New Bedford, Massachusetts, 1882. 57721. U. S. Fish Commission. Common to all whaling-vessels. Used for raising the fin and the "head" of the first blanket-pieces. Some of these chains have a loose ring shackled to the chain for the blubber-hook.

HEAD-CHAIN.

HOISTING IN HEAD OF WHALE (CASE AND JUNK).

CASE-CHAIN.

Case-chain, technically termed the "head-strap," "case-strap," or "junk-strap," employed in the sperm-whale fishery. Length, 7 feet. New Bedford, Massachusetts, 1882. 57722. U. S. Fish Commission. The whale having been decapitated, and the head subdivided, if a large whale, into two sections—the "junk" and "case"—one end of the chain is rove through a hole made in the case or junk; the other is passed through the bight, or loop, and made fast to the lower block of the blubber-tackle. The case, which contains the spermaceti, may be hoisted in a vertical position, the lower end remaining in the water, and its contents bailed over the side of the ship, or it may be hoisted on deck. The entire head of a small whale may be also hoisted in with this style of chain; hence "head-strap." This chain is smaller than those in general use.

TOGGLES, OR FIDS.

BLUBBER-TOGGLE.

The toggle, or fid (57724), made of hard wood, was formerly in general use on all American whaling-vessels, and is used to a certain extent, on many of them at present. This may be included among the earliest implements that have been steadily employed in this fishery. Recently, however, the improved method of strapping the lower block of the blubber-tackle has rendered the fid useless on the vessels which have adopted the new style. Notwithstanding this, the majority of vessels usually carry the fid, to be used if necessary, and more especially the Provincetown schooners, which use this implement altogether. Length, 24 inches. New Bedford, Massachusetts. 57724. Gift of Jonathan Bourne.

Hoisting in Throat.

THROAT-CHAIN TOGGLE.

Iron toggle and chain formerly used for hoisting in the throat of the right or bowhead whale. Length of chain, 5 feet; length of toggle, 2 feet 6 inches. New Bedford, Massachusetts, 1882. 57723. U. S. Fish Commission. The head of the whale having been cut off, a hole is made in the throat, the toggle is inserted—technically, "dropped"—and by means of the blubber-tackle the throat is hoisted on deck.

WHALEMAN'S KNIVES.

Boarding Blubber.

KNIVES USED FOR SUBDIVIDING THE MAIN PIECE INTO SMALLER SECTIONS WHEN HOISTING IN THE BLUBBER.

BOARDING-KNIFE WITH SHEATH.

Blade, steel; double-edged. Socket, iron. Handle, wood, with Turk's head to prevent the hand of the manipulator from losing its *grip* when the instrument is oily. Sheath, two pieces of wood seized with twine. Length of knife and handle, 60 inches. Length of sheath, 31 inches. New Bedford, Massachusetts, 1876. 25676. Gift of W. H. Cook & Co. Used in *boarding* blubber.

BOARDING-KNIFE.

Blade, cast steel; two-edged, with socket for handle. Handle, wood, turned; with cross-piece. Total length; 5 feet. Middletown, Connecticut, 1876. 26608. Gift of A. R. Crittenden. Used when cutting-in the whale for "boarding" the blubber.

BOARDING-KNIFE.

Blade, cast steel; double-edged; handle, wood, with cross-piece, and Turk's head. A boarding-knife with a short blade, evidently broken off, with point sharpened, used in cutting up the ambergris taken by the bark "Falcon." Total length, 4 feet 4 inches. New Bedford, Massachusetts, 1882. 55797. Gift of Thomas Knowles & Co. (Owners of the bark "Falcon"). Stamped, "J. Howard" (Manufacturer).

BOARDING-KNIFE.

Blade, cavalry saber, with hilt. Handle, wood, with cross-piece at end. Total length, 4 feet 3 inches. New Bedford, Massachusetts, 1882. 55798. Gift of Thomas Knowles & Co. Used for cutting the main blanket-piece, as it is rolled from the whale, into small sections, to be lowered into the blubber-room.

BOARDING-KNIFE.

Blade, navy cutlass with brass hilt; handle, turned wood, with knob on the end. New. Total length, 4 feet 4 inches. New Bedford, Massachusetts, 1882. 55868. U. S. Fish Commission. Manufactured by James Barton. Used on a whaling-vessel for cutting the blubber into sections, as it is unwound from the whale, in order that they may be lowered into the blubber-room.

MINCING BLUBBER.

MINCING BY HAND.

MINCING-KNIFE.

Blade, cast steel; back-frame, iron, slotted and riveted to blade. Handles, hard wood; ferules, steel. New. Sheath, wood, saturated in oil. Longitudinal slot for blade of knife. Three holes for rope beckets. Total length, 36 inches; length of blade, 24 inches; width of blade, 3½ inches; length of sheath, 25 inches. New Bedford, Massachusetts, 1876. 25912. Gift of E. B. & F. Macy. Used for mincing small pieces of blubber (horse-pieces) in order that the oil may be more readily extracted when boiled.

MINCING-KNIFE AND SHEATH.

Blade, cast steel; worn out in service by being repeatedly sharpened. Sheath, wood, slotted for blade, and pierced with two holes for beckets. Length of knife, 36½ inches; length of sheath, 25½ inches. Knife, 55869; sheath, 57696. New Bedford, Massachusetts, 1882. Gift of Mackey & Pindar.

MINCING-KNIFE.

An old mincing-knife which has seen many years of service, showing the manner in which the width of blade has been reduced by frequent applications to the grindstone. Length, 36 inches. New Bedford, Massachusetts, 1882. 56849. Gift of Thomas Knowles & Co.

MINCING-KNIFE.

An old blubber-knife worn out in service and discarded, the blade having been ground down until worthless. Handles, wood; back, iron; blade, cast steel. Length, 37½ inches. New Bedford, Massachusetts, 1882. 56850. Gift of Mackey & Pindar.

MINCING BY MACHINERY.

MINCING-MACHINE KNIFE.

A knife of peculiar shape used on some vessels instead of the hand-mincing knife, in connection with the mincing-machine, for

MINCING-MACHINE KNIFE—Continued.

slicing blubber before extracting the oil. Cast steel, holes in either end for fastening the blade to the frame. Length, 21½ inches. New Bedford, Massachusetts, 1882. 55800. Gift of Thomas Knowles & Co.

LEANING BLUBBER.

KNIVES USED IN THE BLUBBER-ROOM FOR REMOVING SMALL PIECES OF FLESH THAT HAVE ADHERED TO THE BLUBBER WHEN CUTTING IN.

LEANING-KNIFE.

Blade, steel; handle, two pieces, hardwood, riveted to shank of blade. Length, 13 inches. New Bedford, Massachusetts, 1882. 56936. Gift of Frederick S. Allen. Used by the "hold gang" of a whaling-vessel, for leaning blubber.

KNIVES USED BY SEALERS.

KNIFE, STEEL, AND SHEATH.

Case containing knife and steel. Sheath, made at sea, wood. Two pieces bound with brass hoops; leathern guard, or strap, for attaching case to waist-belt, stamped with ornamental design and initials (E. T.) of owner. Ordinary steel, handle "run in" with lead. Knife, bone handle, checkered, blade worn by sharpening. Length of case, 10 inches; length of knife, 12 inches; length of steel, 14 inches. New Bedford, Massachusetts, 1882. 56881. Gift of L. & W. R. Wing. Used by the "skinners" (men whose duty it is to skin or flay seals) in the seal and sea-elephant fishery. Herd's Island, Patagonia, South Georges, South Shetland, Desolation Island, &c.

RECEPTACLES EMPLOYED WHEN CUTTING-IN THE WHALE.

SCOOPING SPERMACETI FROM THE WATER.

SCOOP-NET.

Net made of strips of wood and spun-yarn, seized to a pole with spun-yarn. Handle and bow of net broken during transportation. Length, 14 feet. New Bedford, Massachusetts, 1882. 57697. U. S. Fish Commission. A kind of net carried on sperm-whaling vessels, and used during the process of cutting-in the whale, when severing the head, for scooping up small portions of spermaceti which float aft from the roots of the case—*skimming slicks*. Known to the Provincetown whalemen as "Granny-scratches." Obtained from whaling-brig "Varnum H. Hill," of New Bedford, Massachusetts. Has been used, as indicated by the small pieces of spermaceti adhering to the netting.

Bailing the Case.

CASE BUCKET.

Oak staves, bound with three iron hoops; bottom, one piece of wood, conical. Rope bail with leather ears. Length, 24½ inches; depth, 16 inches; diameter of top (inside), 9⅞ inches; diameter of bottom (inside), 6½ inches. New Bedford, Massachusetts, 1882. 55801. U. S. Fish Commission. Before the introduction of the improved windlass on whale-ships, it was impossible to hoist the head of a large sperm-whale on deck; the head was dissected while in the water and hoisted by sections, and the *case* was hauled up to the gangway vertically with its base uppermost. The case-bucket was attached to a whip-tackle, and, by means of a pole, pushed or "set" into the immense reservoir of oil and fat which comprise the spermaceti, and the contents were emptied into casks and tubs on deck.

Belts employed to support the Men.

MONKEY-BELT.

A wide canvas belt and a rope-tail. Canvas doubled, with a rope crinkle in each end, through which one end of the rope is passed and spliced to the standing part, leaving a loop large enough to allow the belt to be properly adjusted about the waist of a man. New. Length, 28 feet. New Bedford, Massachusetts, 1883. 57716. U. S. Fish Commission. A kind of belt worn by the man who goes overboard on the whale when cutting-in. The rope-tail is manipulated from the vessel by another man who steadies the one on the whale while engaged in adjusting the blubber-hooks, cutting off the head, &c.

STAGE-LINES.

Canvas belt and two rope-tails. Canvas doubled and stitched along the center. Two grommets, one in each end, through which the rope-tails (1¾ inch rope) are rove and spliced. Ends of ropes whipped. Length, 18 feet. New Bedford Massachusetts, 1882. 57713–4. Gift of Jonathan Bourne. Made fast to the main rail of the vessel and used to prevent the officers falling overboard when cutting in the whale.

Reeving Chains through Blubber.

WHALEMAN'S NEEDLE.

Hard wood; conical; recessed at large end. Rope becket for bending on small line. Length, 26 inches. Provincetown, Massachusetts, 1882. 57707. Gift of Stephen Cook. Used by sperm whalemen for reeving a small rope through a hole made in the *case* or *junk*, by means of which the head-chain or junk-chain may be hauled through.

Manipulating Blubber-Hooks.

BLIND BOAT-STEERER.

Handle, wood. Jaws, iron, resembling those of a boom, or gaff, of a sailing-vessel. Length, 7 feet 5 inches. Provincetown, Massachusetts, 1882. 55803. Gift of Mr. Stephen Cook. Used on some whaling-vessels for pressing upon the *back* of the hook in guiding the point into the hole of the blubber of the first blanket-piece. By using this instrument the boat-steerer, whose duty it is to go overboard on the whale to insert the hook, may, in rugged weather, accomplish this from the cutting-stage. Blind boat-steerer, Provincetown, Massachusetts; dog's-legs. New Bedford and Edgartown.

Platforms for Officers when Cutting-in the Whale.

CUTTING-STAGE.

A kind of platform, technically called the "forward cutting-stage," upon which the second mate stands when cutting-in a whale. The position for the stage, when in use, is on the outside of the vessel, resting against and braced from the side, by the cross-pieces, and made fast to the rail by the ropes. Not much used at present, having been supplanted by an improved form known as the "outrigger stage." Length, 42 inches; width, 16 inches. New Bedford, Massachusetts, 1882. 57727. Gift of Jonathan Bourne.

TRY-WORKS GEAR.

Bailing Oil from the Pots.

LONG-HANDLED BAILER.

Bailer, tin; shank, wrought iron. Length, including handle, 13 feet. New Bedford, Massachusetts, 1882. 57749. U. S. Fish Commission. Used for transferring hot oil from the try-pots to the cooler. Present style.

HANDLE OF BAILER.

Handle and yoke of bailer common to all whaling vessels, showing rudely-carved figures of whales cut into the wood by the officer of the watch, indicating the number and species of whales boiled out. Bailer, wanting. New Bedford, Massachusetts, 1828. 55809. Gift of Jonathan Bourne. Marks indicate that it has been in service on several voyages, and in the several branches of the fishery: "B. H.," Bowhead whale; "S.," Sperm Whale; "H. B.," Humpback, and "W.," the Whale, or Right Whale.

REMOVING SCRAPS FROM TRY-POTS.

SCRAP-DIPPER.

Bowl, sheet iron, perforated; shank and socket, wrought iron; pole, wood. Manufactured by sheet-iron workers. Total length, 13 feet. New Bedford, Massachusetts, 1882. 55806. U. S. Fish Commission. A kind of skimmer or colander for removing the refuse pieces of blubber, commonly known as *scrap*, from the try-pots. Formerly made of copper or brass, but at present usually of heavy tin or galvanized sheet iron. An improved form.

BLUBBER-PIKES.

HANDLING BLUBBER WHEN MINCING.

BLUBBER-PIKE.

Small iron pike with socket and pole, used on whaling vessels for handling horse-pieces during the process of mincing the blubber. Length, 5 feet 10 inches. New Bedford, Massachusetts, 1876. 25615. Humphrey S. Kirby.

BLUBBER-PIKE.

Common iron pike with spur for attaching the instrument to the pole; strengthened by a metal band. Length, 4 feet 9 inches. New Bedford, Massachusetts, 1876. 25617. Humphrey S. Kirby. From the fore-hold of a returned whaler. Used in handling blubber when trying-out.

BLUBBER-PIKE.

A single-pointed instrument, iron, attached to a rough wooden pole by means of a spur, and held by a metal band or ferule. Total length, 4 feet 9 inches. New Bedford, Massachusetts, 1876. 25617. Humphrey S. Kirby. Used on the deck of a whaling-vessel when "mincing" for transferring horse-pieces from the blubber-tub to the mincing-tub.

POT-PIKES.

STIRRING FIRES AND HANDLING SCRAP.

POT-PIKE.

A small pike, consisting of a spur, shank, socket, and pole, with a collar welded near the bend to prevent the scrap from sliding up the shank. Length of pike, 33 inches. New Bedford, Massachusetts, 1882. 57704. Gift of James Barton. Used for removing scrap from the try-pots, pitching scrap as fuel into the arches, and for stirring up the fires.

BLUBBER FORKS.

Mincing and Trying-out.

Horse-piece fork.

A small pitch fork, all iron, with two tines. Handle parceled. Rare. Usually has wooden poles. Length, 4 feet 9½ inches. Provincetown, Massachusetts, 1882. 57703. U. S. Fish Commission. Used in the blubber-room and on deck for handling horse-pieces when mincing and trying-out.

Horse-piece fork.

Small iron fork with two tines and wooden pole. Length, 4 feet 6 inches. New Bedford, Massachusetts, 1882. 57702. Jonathan Bourne. Used for transferring horse-pieces from the blubber-tub to the mincing-tub, and for pitching horse-pieces from the blubber-room on deck.

Blubber-fork.

Small iron fork with two tines, short shank and wooden handle, formerly used for pitching horse-pieces into the try-pots, but superseded by a similar instrument (25950) with longer prongs. Length, 8 feet 9 inches. New Bedford, Massachusetts, 1882. 55818. Gift of Mackey & Pindar.

Blubber-fork.

Small iron fork with two tines, socket, and pole. Used at present for pitching blubber into the try-pots. Length, 5 feet 7 inches. New Bedford, Massachusetts, 1876. 25950. Gift of E. B. & F. Macy.

BLUBBER-GAFFS.

Lowering Blubber in Main Hatch and Hauling Blubber about Deck.

Blubber-gaff.

Common iron gaff with a spur at rear end for attaching the instrument to a common pole, and held fast by a metal band. Length, with pole, 4 feet 10 inches. New Bedford, Massachusetts, 1876. 57699. U. S. Fish Commission. Used when cutting-in a whale for "pointing" the blanket-pieces over the main hatch when lowering them into the blubber-room.

Blubber-gaff.

Common iron gaff attached to a rough pole. Obtained from a whaling and sealing vessel, and used when lowering the blanket-pieces down the main hatch. Length, 42 inches. New London, Connecticut, 1882. 57706. Gift of C. A. Williams & Co.

LIGHTS.

Try-works Lanterns.

Bug-light.

An open-work receptacle made of hoop-iron, formerly suspended between the try-works pipes, filled with scrap, and used as a lantern, when boiling out at night. Superseded by a glass lantern. New Bedford, Massachusetts, 1882. 57717. Gift of Jonathan Bourne.

Cutting-in Whale at Night.

Bug-light.

Open-work receptacle for "scrap" made of pieces of hoop-iron; handle, broken oar served with rope-yarn. Length, 11 feet 8 inches. New Bedford, Massachusetts, 1882. 55802. Gift of Jonathan Bourne. Made on a whaling vessel, undoubtedly by the blacksmith. An apparatus which may be projected over the side of a vessel, and lashed to the main-rail, while cutting-in a whale at night, and used as a lantern; the bowl-shaped receptacle at the end being filled with scrap and ignited. It may also be used when boiling out the oil for removing the scrap.

ROPES USED BY WHALEMEN.

On the Vessel.

Fluke-rope.

The largest rope employed by whalemen. Formerly used for fastening the whale to the vessel, but has been almost wholly superseded by a large chain (fluke-chain). The whale having been killed, it is towed to the vessel; the fluke-rope is passed around that portion of the animal known as the *small*, the junction of the caudal fin (flukes) and body, and made fast to the vessel. Manila hemp; circumference, 8 inches; three strands. New Bedford, Massachusetts, 1882. 56390. New Bedford Cordage Company.

Cutting-falls.

A kind of rope technically known as the *cutting-falls*. Full length should be 38 or 40 fathoms. Used in connecting the lower and upper blocks, forming a *purchase*, commonly known as the "cutting-tackle" or the "blubber-tackle," by means of which the blubber is unwound in spiral strips from the whale, hoisted in, and lowered into the blubber-room. Manila hemp; four strands; circumference, $5\frac{1}{4}$ inches. New Bedford, Massachusetts, 1882. 56391. New Bedford Cordage Company.

GUY-ROPE.

A kind of rope used on a whale-ship. Rove through the guy-block to hold the upper blocks of the cutting-tackle stationary when suspended over the main hatch, while hoisting in the blubber. Manila hemp; circumference, $4\frac{3}{4}$ inches; number of strands, 4. New Bedford, Massachusetts, 1883. 56392. New Bedford Cordage Company.

YARN FOR TYING BUNDLES OF WHALEBONE.

BONE-YARN.

Sample of bone-yarn carried by right whalemen, and used in tying up bundles of whalebone (baleen). Made of Russian hemp, tarred; two yarns carded together; circumference, $\frac{7}{8}$ inch. New Bedford, Massachusetts, 1882. 56395. New Bedford Cordage Company.

WHALE-LINE, WARPS, AND STRAPS.

USED IN THE BOAT.

WHALE-LINE.

A kind of rope used in all American whale-boats during the capture for fastening the whale to the boat. Manila hemp; three strands; circumference, 2 inches. New Bedford, Massachusetts, 1882. 56393. New Bedford Cordage Company.

IRON-STRAP, SHOWING EYE-SPLICE.

A piece of tow-line, technically termed an "iron-strap," which, when used, is made fast at one end to the shank of the harpoon near the socket; has an eye-splice in the other for bending on the whale-line. Manila hemp; circumference, 2 inches; three strands. New Bedford, Massachusetts, 1882. 56396. Manufactured and presented by the New Bedford Cordage Company. (Prepared by Captain Isaiah West.)

LANCE-WARP.

A sample of the smallest line employed during the capture of a whale. One end of about eight fathoms of this line is made fast to the hand-lance and its pole, the other being fastened to the boat, and used in manipulating the lance when the officer of the boat is killing the whale. Manila hemp; circumference, $\frac{3}{4}$ inch; number of strands, 3. New Bedford, Massachusetts, 1882. 56394. New Bedford Cordage Company.

LANCE-STRAP.

A piece of lance-warp showing eye-splice, intended to be fastened to the shank of the hand-lance at the socket by a round turn and splice; seized to the pole in two or three places with rope-

LANCE-STRAP—Continued.

yarn, with an eye-splice in the other end for making fast the lance-warp. Length should be 6 or 7 feet. New Bedford, Massachusetts, 1882. 56399. Manufactured and presented by the New Bedford Cordage Company.

SHORT WARP.

A piece of whale-line, with a bowline at one end, and crowned and the ends expended at the other to prevent the rope from unlaying (unraveling). One end of this warp is intended to be made fast to the strap of the "second iron"; the other end is bent around the whale-line with a bowline, in order that the line may be run freely when taken out by the whale. Manila hemp, 2 inches in circumference, three strands. Length, 4 fathoms. New Bedford, Massachusetts, 1882. 56397. Manufactured and presented by the New Bedford Cordage Company.

WAIFS AND FLAGS.

LOCATING THE WHEREABOUTS OF DEAD WHALES, AND SIGNALS FOR THE VESSEL.

BOAT-WAIF.

A small flag with a grayish blue (dungare) ground and white square and compass (cotton cloth), made fast to a slender pine pole; 55 by 34 inches. 56854. U. S. Fish Commission. A kind of flag used as a signal in a whale-boat, and for *waiving* (marking) a dead whale.

BOAT-WAIF.

Small flag with white field (cotton cloth) and dungare crescent, attached to a slender pine pole; 55 by 34 inches. 56855. U. S. Fish Commission. A kind of flag used as a signal in a whale-boat, and for *waiving* (marking) a dead whale.

NATIONAL FLAG.

AMERICAN ENSIGN.

Ensign carried twelve years in the Hudson Bay fishery by the whaling-schooner Abbie Bradford (114.75 tons), of New Bedford, Massachusetts. 8 by 12 feet. New Bedford, Massachusetts, 1882. 57720. Gift of Jonathan Bourne. The American ensign is always carried at the mizzen peak by whaling-vessels.

IMPLEMENTS USED ASHORE.

FOR SCRAPING AND CLEANING SLABS OF BALEEN, AND BY COOPERS, BOTH ASHORE AND AT SEA, FOR SMOOTHING THE INTERIOR SURFACES OF WOODEN UTENSILS.

BONE-SCRAPERS.

BONE-SCRAPER.

Handle, wood; blade, common hoop-iron, riveted to handle. Roughly made. Length, 8½ inches. New London, Connecticut, 1882. 57072. Gift of Lawrence & Co.

SCRAPER.

Roughly-made handle, wood; half ovate blade with spur for insertion in handle. Metal ferule. Length, 8¼ inches. New Bedford, Massachusetts, 1882. 57074. Gift of Jonathan Bourne. May be used as a bone-scraper or inshave.

BONE-SCRAPER.

Handle, rough wood; iron shank; ovate frame forming the blade, common hoop-iron. Blade riveted to shank. A very old specimen. Length, 11½ inches. New Bedford, Massachusetts, 1882. 57076. Gift of Thomas Knowles & Co.

BONE-SCRAPERS.

Blades, steel, slotted vertically in handle. Handles, wood; holes in handles for small laniards. Length, 3¼ inches. New Bedford, Massachusetts, 1882. 57068. Gift of F. S. Allen. Used in cleaning whalebone (baleen).

COOPER'S INSHAVES.

INSHAVE.

Handle, turned wood. Iron frame, a true oblong ovate, with blade on forward edge, and spur for insertion in handle. Metal ferule. Length, 11½ inches. New Bedford, Massachusetts, 1882. 57067. Gift of Jonathan Bourne.

COOPER'S SMALL INSHAVE.

Handle, wood. Iron frame, oblong ovate; cutting-edge on forward part. Metal ferule. Length, 10 inches. New Bedford, Massachusetts, 1882. 57069. Gift of John McCullough.

COOPER'S LARGE INSHAVE.

Handle, turned wood. Iron frame with cutting edge and rear extension for attaching to handle. Length, 12¼ inches. New London, Connecticut, 1882. 57070. Gift of C. A. Williams & Co.

COOPER'S LARGE INSHAVE.

Socket and shank, iron. Ovate frame with sharp cutting-edge. Length, 19¼ inches. New London, Connecticut, 1882. 57071. Gift of C. A. Williams & Co.

COOPER'S INSHAVE.

Handle, wood; blade, steel, with spur for fastening to handle. No ferule. Old. Length, 6¼ inches. New London, Connecticut, 1882. 57073. Gift of C. A. Williams & Co.

COOPER'S INSHAVE.

Handle, wood; frame, acute ovate, with forward cutting-edge riveted to handle. Length, 7 inches. New Bedford, Massachusetts, 1882. 57075. Gift of Thomas Knowles & Co. An old inshave used for many years on a whaling-vessel.

LOGS OF WHALING-VESSELS.

LOGS.

Journals containing daily entries of the vessels' routine; remarks upon the weather, sky, wind, localities, and whaling-grounds visited, including latitudes and longitudes, the number of whales captured, amount of oil boiled out and stowed down, and other matters of importance which tend, in the aggregate, to make a true register of the voyages. The mates usually keep the logs, which are, in many cases, illustrated with cuts of whales and profiles of the islands passed or visited during the voyage. A figure of a sperm-whale, for example, stamped upon the page of a journal with the initials "L. B." and the figures "40," indicates that upon the day of that entry a sperm-whale, yielding 40 barrels of oil, was captured by the larboard boat. The *flukes* of a whale in a vertical position indicate that whales were seen but not captured. Half of a whale indicates that the vessel "mated," that is, entered into an agreement with another vessel to jointly capture the whale, and that she secured one-half of the prize. The "twenty-four hours" commences at 12 o'clock at night and ends at 12 midnight. Formerly the English sea-journals' day, or twenty-four hours, "used to terminate at noon, because the ship's position is then generally determined by observation; but the shore account of time is now adopted afloat."*

WHALEMAN'S LOG.

Journal of bark Peri, Capt. E. Russell. Sailed Friday, June 29, 1854, from New Bedford, Massachusetts, for the Indian Ocean on a sperm-whaling voyage, and returned May 26, 1857. Edgartown, Massachusetts, 1882. 56865. Gift of John W. Norton.

* Admiral W. H. Smyth.

WHALEMAN'S LOG.

Journal of a part of a voyage made by bark Virginia, R. G. Luce, commander. Sailed from New Bedford, Massachusetts, August 15, 1855, for the Pacific Ocean. Edgartown, Massachusetts, 1882. 56866. Gift of Thomas M. Peakes.

WHALEMAN'S LOG.

Journal of ship Mary, of Edgartown, Massachusetts, Capt. G. A. Baylies. Sailed on a whaling voyage June 8, 1852. Edgartown, Massachusetts, 1882. 56867. Gift of Mrs. E. A. Gannett.

WHALEMAN'S LOG.

Journal of bark "Adeline Gibbs," Captain G. H. Baylies, of Fairhaven, Massachusetts. Sperm-whaling voyage in the Pacific Ocean, 1841–1845. New Bedford, Massachusetts, 1882. 56868. Gift of John McCullough.

WHALEMAN'S STAMP.

Redwood stamp with figure of sperm-whale (*Physeter macrocephalus*). Length, 3¼ inches. Edgartown, Massachusetts, 1882. 56869. Gift of Capt. J. E. Osborn. Made at sea by Captain Osborn, and used in stamping the figures of whales in log-books.

WHALEMAN'S LOG SLATE.

Double slate; wooden backs, hinged. Used by the mate for making rough notes which are subsequently entered in the journal. Dimensions, 17 by 17½ inches. New Bedford, Massachusetts, 1882. 56870. Gift of Daniel Kelleher.

WHALEMAN'S SLATE-PENCIL BOX.

Common wooden box used by the mate of a whaling vessel, as a receptacle for slate-pencils. Length, 8¼ inches. New Bedford, Massachusetts, 1882. 56871. Gift of Daniel Kelleher.

WHALING-VOYAGE JOURNAL.

Journal of the ship Dauphin in verse (doggerel). Composed by Charles Murphey, third mate, on the voyage. Ship Dauphin sailed September 4, 1820, from Nantucket. New Bedford, Massachusetts, 1881. 56893. Gift of Captain Amos C. Baker.

'Twas one-and-twenty men we had
This voyage to pursue,
And a sperm-whaling we were bound
On Chili and Peru.

MEMORANDA OF OUTFIT OF A WHALING VESSEL.

Small pamphlet with printed lists of supplies required for a whaling vessel. New. New Bedford, Massachusetts, 1883. 57020. James V. Cox.

SHIP'S PAPERS.

Copies of papers carried by whaling bark Bartholomew Gosnold, of New Bedford, Massachusetts, outward bound. Register, 57016; whalemen's shipping papers, 57017; certificate to shipping articles, 57018; crew lists, 57019; master's certificate, 57020; custom-house fees, 57021; bill of health, 57022. New Bedford, Massachusetts, 1883. Captain James V. Cox and Mr. James Taylor.

ACCESSORIES.

BELLY-BAND.

Consists of a belt and two rope-tails. Belt, braided rope, with an eye in each end, into which the ends of the two ropes are respectively spliced. Total length of belt and ropes, 11 feet. New Bedford, Massachusetts, 1882. 57715. Gift of Jonathan Bourne. Used by the men when drawing water over the side of the vessel when the ship is under way. The belt having been adjusted about the waist of a man, who stands on the chains, the free ends of the ropes are made fast to the main-chains of the ship. The man, thus supported, having filled the bucket with water, swings it up to another man, who leans over the rail. The contents having been emptied into a large deck tub, the bucket is again hove overboard and the operation repeated until a sufficient quantity of water has been obtained.

WHALEMAN'S BOOT-JACK.

Yellow pine; rest, Spanish cedar. Made on a whaling vessel. (Scrimshaw). Length, 13 inches. New London, Connecticut. 1882. 56883. Gift of Lawrence & Co.

WHALEMAN'S "BELL."

Wood, oak; three pieces; evidently made of an oil-cask stave. Center-piece with a projecting handle; short side-pieces, seized to the handle-piece with a leathern thong. Total length, 11 inches. New Bedford, Massachusetts, 1882. 56882. Gift of Captain Henry Clay. Obtained from the whaling schooner Golden Eagle, known as the "cracker," "rattler," and "Nantucket bell." One of the oldest implements employed on whaling vessels, and used at present on some of the Provincetown and New Bedford schooners, whose crews retain the customs and habits of the early whalemen. The full-rigged barks and ships, however, have discarded the "clapper," and in its place use the bell common to all first-class vessels. When the time arrives for relieving the man at the wheel, he calls another member of the watch by *rattling the bell*.

WHALEMAN'S HAND-CUFFS.

Pair of hand-cuffs (with key), connected by two loose links and a swivel. Length, 9.2 inches. New Bedford, Massachusetts. 1882. 56887. U. S. Fish Commission. Common to all whaling vessels for enforcing discipline, manacling insubordinate, pugilistic, or drunken members of the crew, and deserters if caught.

PAIR OF SKATES.

Foot-rest, hard wood; runners made from old files, fastened to the rear ends of skates with common wood-screws, the projecting ends of the latter secured to the boot-heel when used. Heel-straps, common leather; wanting front straps. Length, 12 inches. New London, Connecticut, 1882. 56885. Gift of Lawrence & Co. Made at sea, and used by sea-elephant hunters.

REEL AND LOG-CHIP.

Reel, wood; iron axle, projecting wooden handles. End-pieces bucked with iron. Log-chip, common form, triangular; base armed with lead. Length of reel, 25 inches, 57081; size of chip, 6 by 6 inches, 57080.

ANIMAL-TRAP.

Common steel trap. "Hawley & Norton, No. 1" (New York), used by whalemen in the Arctic regions for the capture of foxes and other small animals for their fur. Length, 31 inches, including chain. New London, Connecticut, 1882. 57799. Gift of C. A. Williams & Co.

MAIN-ROYAL POLE.

Pine, made expressly for its present use, showing its connection with the lookout bows. Those in active service are made of spruce or southern pine. Length, 8 feet 6 inches. Washington, D. C., 1883. 57719. U. S. Fish Commission.

MINUTE-GLASS.

Common glass formerly used in connection with the log. Old. Four uprights, seized at top and bottom with twine. Height, $4\frac{3}{8}$ inches. New Bedford, Massachusetts, 1882. 57082. Gift of Jonathan Bourne.

LOOKOUT BOWS.

Two iron rings; parceled; shackled to main-royal pole. Inside diameter, 18 inches. New Bedford, Massachusetts, 1882. 57718. U. S. Fish Commission. A support for the men when on the lookout for whales. The men climb up, and by means of the rigging lower themselves into the bows, and standing upon the cross-trees, support themselves by grasping the rings or rigging.

MARINE GLASS BAG.

Garnet plush, with canvas shoulder-strap, made at sea, and used as a receptacle for the marine glass. Obtained from a sealing vessel. 6 by 8 inches. New London, Connecticut, 1882. 57710. Gift of Lawrence & Co.

MARINE-GLASS CASE AND BAG.

Bag, canvas, with rope strap; ordinary marine-glass case, small size. Used by officers and boat-steerers when at the mast-head on the lookout for whales. 7 by 7¼ inches. New Bedford, Massachusetts, 1882. 57709. U. S. Fish Commission.

MARINE-GLASS BAG.

Small canvas bag, with rope shoulder-strap, used by the men on the lookout for whales as a receptacle for the marine glass. 7¼ by 9 inches. New Bedford, Massachusetts, 1882. 57708. Gift of Thomas Knowles & Co.

WHALEMAN'S BUNG-THIEF.

Wood, one piece. Gouged out. Leather bail and codline laniard. One side loaded with lead, for submerging the cup; opposite side chamfered for convenience in drinking. Made at sea. Length, 12½ inches. New Bedford, Massachusetts, 1882. 56873. Gift of Loum Snow & Son. A drinking cup carried on the deck of a whaling vessel for obtaining fresh water, its proper place being on or about the fresh-water tank. If the cask rests upon its bilge, the "thief" may be inserted through the bung-hole, and the supply of water obtained, or if the cask stands upon one end, as is often the case, the "thief" is dropped through a square-cut hole in the head.

ESSENCE OF SPRUCE.

A pint bottle, colorless glass, containing essence of spruce. Included in the outfit of whaling vessels for making spruce beer which contains water, molasses, and essence of spruce mixed; placed in a cask and fermented. Height, 10½ inches. New Bedford, Massachusetts, 1882. 56876. Gift of Daniel Kelleher.

WHALEMAN'S LEG-IRONS.

Small iron rod with two loose shackles for the ankles, and one loose shackle for chaining the victim to some stationary object. Length, 11 inches. New Bedford, Massachusetts, 1882. 56878. U. S. Fish Commission. Used on insubordinate members of the crew, who, when manacled, are placed in the run, or between decks in the blubber-room, and kept on bread and water until they are willing to comply with the rules of the ship. Not often used, but always carried on whaling vessels.

WHALEMAN'S SHOES.

A kind of brogan worn by whalemen; No. 11, pegged. New Bedford, Massachusetts, 1882. 56879. U. S. Fish Commission.

WHALEMAN'S SHIP-BREAD.

A kind of ship biscuit, usually known as "hard-tack," common to the majority of sea-going vessels. Weight, 3¼ ounces. New Bedford, Massachusetts, 1882. 56880. Gift of J. T. Buttrick (Manufacturer). Baked expressly for a whaling voyage, made of common wheat flour and cold water, without salt or other ingredients; kneaded, cut into shape, and perforated by machinery driven by steam, and baked on soap-stone in a rotary oven; packed in air-tight ten-barrel casks when stowed away in the ship's hold.

SCRIMSHAW WORK AND CURIOSITIES.

WHALEMAN'S TROUSERS.

Pair of canvas pants, old style, with fly, showing rent made by the jaws of a shark. Worn by N. N. Cook, schooner "Belle Isle," Provincetown, Massachusetts, when bitten by a shark, on February 22, 1841, in Samana Bay, West Indies, while discharging the duties of boat-steerer on the whale, adjusting the blubber-hook when cutting-in. Full length, 37 inches; waist, 28 inches. Provincetown, Massachusetts, 1882. 56898. Gift of N. N. Cook.

SCRIMSHAWED SHIP.

Model of whale-ship carved in relief; hull, sails, masts, and spars, wood. All sails set. Hull painted black; sails, white. Waves represented by putty, painted. Box frame. Size of frame, 26¼ by 13½ inches. New London, Connecticut, 1882. 57059. Gift of Lawrence & Co. Made at sea by a whaleman.

CANE.

Walking-stick made of whalebone (baleen) by a whaleman at sea (*Scrimshaw* work). Heart, several pieces, wrapped spirally with strips of baleen, and *wormed* with cord of the same material. Three Turk's head, baleen, at top, bottom, and center. Length, 33 inches. Edgartown, Massachusetts, 1882. 56897. Gift of J. W. Coffin.

WHALEMAN'S BANJO.

Body, an old tin fruit or vegetable can, over one end of which a piece of porpoise skin is strained and held with spun-yarn. Neck, hickory; sound-board and pegs, pine. Three strings, common wrapping twine, waxed. Length, 20 inches. Provincetown, Massachusetts, 1882. 56872. Gift of George O. Knowles. Made on board schooner "Quickstep," of Provincetown, Massachusetts, by a negro (Portuguese) whaleman. It is said by his shipmates that the manufacturer "discoursed most excellent music" upon this rudely constructed instrument.

WHALEMAN'S PITCH-DIPPER.

A utensil made by attaching a pine wood handle to a common periwinkle shell (*Sycotypus canaliculatus*), and used for handling pitch when paying deck-seams. Length, 10 inches. New London, Connecticut, 1882. 56875. Gift of Lawrence & Co.

JIG-TACKLE.

Forward part of jig-tackle, grafted and painted. Crupper-like arrangement at forward end for shipping over the bow-chock; ivory block at other end. After end wanting. Length, 4 feet 4½ inches. Noank, Connecticut, 1880. 57065. Made and presented by Captain H. C. Chester. A tackle in which many of the boat-steerers take great pride. Used to prevent the whale-boat from chafing when on the cranes.

JIG-TACKLE.

Two parts, the forward and after ends accompanied by the falls. The ropes forming both parts are unla d; each strand neatly covered with canvas and braided into round "sennit." The strap forming the forward part has in one end a crupper-like arrangement, covered with leather to prevent chafing, which fits over the bow chocks of the whale-boat, and a small eye in the other end for a block. The strap forming the after end has at one extremity an eye for a block, and a wooden cleat at the other, which is made fast to the bearer. The two parts when in use are hauled together and hold the whale-boat when transported on the vessel in its proper position; both parts painted blue. Chafed and worn in service. Falls, 9-thread manila. Length of forward part, 20 inches; length of after part, 60 inches. New Bedford, Massachusetts, 1882. 57728. Gift of L. & W. R. Wing.

MAN-ROPES.

Rope, grafted with cotton cloth and painted white. Man-rope knot at one end, *painted* at the other. One pair. Length, 9½ feet. New Bedford, Massachusetts, 1882. 57060. Gift of L. & W. R. Wing.

MAN-ROPE STANCHIONS.

Bone, cut from the *pan* of the sperm-whale's jaw. Known to whalemen as ivory. Feet square-cornered to ship in sockets in vessel's rail. Eye in upper end for man-rope. One pair. Length, 15 inches. New Bedford, Massachusetts, 1882. 57062. Gift of Daniel Kelleher.

CHEST-BECKETS.

Rope strands braided; painted green. Flemish eyes; cross-bar passing through eyes and knotted at each end. One pair. Length, 11 inches. New Bedford, Massachusetts, 1882. 57061. Gift of L. & W. R. Wing. Made at sea by a whaleman and used as beckets or handles for clothes-chest.

SPLICING-FID.

Bone-fid made from *pan* of sperm-whale's jaw. Usually called ivory by whalemen. Length, 11½ inches. New Bedford, Massachusetts, 1882. 57063. Gift of Daniel Kelleher. *Scrimshaw* work, made at sea by a whaleman. Ordinary fid for splicing rope.

COG-WHEEL.

A ratchet wheel made of "ivory" (*pan* of sperm-whale's jaw). Iron shaft. Length, 4¾ inches. New Bedford, Massachusetts, 1882. 57064. Gift of Daniel Kelleher. *Scrimshaw* work, made at sea by a whaleman for some mechanical device.

SABER.

A common cavalry saber obtained from a whaling vessel. Length, 37 inches. New London, Connecticut, 1882. 56886. Gift of Messrs. Lawrence & Co. Used on board ship in the manufacture of boarding-knives, etc.

MACHETA-KNIFE.

Thick, heavy blade, with a wide, curved point. Handle horn. Length, 27¾ inches. New London, Connecticut, 1882. 56874. Gift of Lawrence & Co. Knives of this character are used in the West Indies for cutting sugar-cane; in Mexico, Central America, and tropical South America as an axe for felling trees, as well as for defensive and offensive weapons. A similar form is also used by rubber-hunters. Imported by whalemen. Used on board whaling vessels in the manufacture of knives, etc.

WAR-CLUB.

Two-edged sword, cocoanut wood (*Cocos nucifera*), armed on the sides of blade with sharks' teeth (genus allied to *Carcharias*). Teeth seized with coir. Becket in handle, coir. Length, 28 inches. Edgartown, Massachusetts, 1882. 56895. Gift of J. W. Coffin. Obtained in South Pacific and brought home as a "curio" by a whaleman.

EAR-BONE OF CALF-WHALE.

Ear-bone of sperm-whale calf (*Physeter macrocephalus*), brought home as a *curio*. Fairhaven, Massachusetts, 1882. 56894. Gift of Girard S. Robinson.

KANAKA-LINE.

Heart, coir. Surface, plaited vegetable fiber. Edgartown, Massachusetts, 1882. 56896. U. S. Fish Commission. Brought home by a whaleman. Said to be used by natives of the Sandwich Islands as an ornament for the person by affixing shells and small teeth, and in the manufacture of baskets, etc. Called by whalemen "Kanaka-line."

MODEL OF ESKIMO SALMON-SPEAR.

Model of a kind of salmon-spear used by the Eskimo of Hudson Bay. Wooden handle, with a central brass barbless spear, and two diverging wooden prongs, with bent tacks as barbs. Length, $13\frac{3}{4}$ inches. New Bedford, Massachusetts, 1882. U. S. Fish Commission. This model was made by a native at the request of a whaleman, and is said to be a correct representation of the original, with the exception of the tacks, wooden prongs, and brass spear—these parts being usually made from bone. Obtained from the crew of whaling brig "George and Mary."

ESKIMO SPOON.

A domestic utensil, made from the horn of the musk-ox, used by Eskimo of Hudson Bay as a spoon in eating soup. Length, $2\frac{5}{8}$ inches. New Bedford, Massachusetts, 1882. 63145. U. S. Fish Commission. Obtained from crew of whaling brig "George and Mary."

ESKIMO HUNTING-CASE, BOWS, AND ARROWS.

Case, deer-skin; one bow has end-pieces made of the ribs of the deer, and center-piece made of walrus tusk; the other bow is made of ribs of deer and wood. Thongs made from sinew of the deer. Bows and case have been used. Arrows new. Length of case, $34\frac{1}{4}$ inches. New Bedford, Massachusetts, 1882. 68127. U. S. Fish Commission. Used by some of the tribes in hunting deer, walrus, musk-ox, seal, bears, partridges, etc. Obtained from crew of whaling brig "George and Mary."

ESKIMO PIPE.

Small bowl of the Chinese form. Stem, two pieces of wood, bound with two small brass hoops or rings. Ornamented with glass beads, red, white, and blue, and pendant shark's-teeth. Length, 7 inches. New Bedford, Massachusetts, 1882. 68140. U. S. Fish Commission. Obtained from crew of whaling brig "George and Mary."

ESKIMO SHOES.

Pair of infant's shoes worn indoors, seal-skin, sewed with thread made from the sinew of the backbone of the deer. Eskimo, Hudson Bay. Length, $4\frac{1}{8}$ inches. New Bedford, Massachusetts, 1882. 68142. U. S. Fish Commission. Obtained from crew of whaling brig "George and Mary."

ESKIMO THREAD.

Sinew of the backbone of the deer, used by Eskimo of Hudson Bay in making clothing, shoes, thongs for bows, tying up the hair, etc. Length, 22 inches. New Bedford, Massachusetts, 1882. 68144. U. S. Fish Commission. Obtained from crew of whaling brig "George and Mary."

PIECE OF BLACKSKIN.

A small section of tough skin, termed "white-horse," cut from the "bonnet" of a right-whale, invested with crustacean parasites, the "barnacles" of the whalemen; shows the ravages of cock-roaches while on the vessel. Brought home as a curio. Length, 8½ inches. New Bedford, Massachusetts, 1882. 57094. U. S. Fish Commission.

SHELL HOOK.

Shank made from the hinge of a pearl-bearing shell (*Avicula margaritifera*); hook portion of border of probably the same species, made fast to shank with a *seizing* of some vegetable fiber. Length, 5 inches. New Bedford, Massachusetts, 1882. 68139. U. S. Fish Commission. Called "Kanaka hook" by whalemen, the word "Kanaka" being vaguely and comprehensively applied to articles obtained from the islands of the South Pacific.

CHILD'S STOCKINGS.

Seal-skin, sewed with thread made from the sinews of the back of the deer. Made and used by Eskimo, Hudson Bay. Length, 5 inches. New Bedford, Massachusetts, 1882. 68143. U. S. Fish Commission. Obtained from crew of whaling brig "George and Mary."

EYE-PROTECTORS.

Wood; two longitudinal slits; straps made from red cloth, used by Eskimo, Hudson Bay, and American whalemen, to shield the eyes from the glare of sun and snow. Length, 4⅜ inches. New Bedford, Massachusetts, 1882. 68141. U. S. Fish Commission. Obtained from crew of whaling brig "George and Mary."

SNOW-KNIFE.

Long blade, said to be made from a whaleman's boarding-knife, the original having been made from a navy cutlass. Handle, walrus ivory. Length, 17½ inches. New Bedford, Massachusetts, 1882. 68125. U. S. Fish Commission. Obtained from one of the crew of whaling brig "George and Mary." Made and used by Eskimo, Hudson Bay, for cutting out blocks of snow in building igloos, as well as for cutting walrus meat.

IDOL.

A species of the gourd family (*Leginaria vulgaris*), obtained by a whaleman from a small island near the coast of New Guinea, East Indies. As near as the captain of the vessel could understand from the pantomimic gestures of the natives, it was worshiped as an idol, and represented the "organs of generation, or principle of life."—John H. Thomson. New Bedford, Massachusetts, 1882. 68138. Gift of John H. Thomson.

ABORIGINAL APPARATUS.

IMPLEMENTS USED BY THE INDIANS OF CAPE FLATTERY AND THE ESKIMO TRIBES OF THE ARCTIC REGIONS.

THE INDIANS OF CAPE FLATTERY.

The Indians of Cape Flattery are the only representatives of their race south of Alaska who engage actively and energetically (for Indians) in whaling within the limits of the United States. It may, therefore, be of interest to give some account of this people; and to that end I have compiled the following data from the "Indians of Cape Flattery"* by James G. Swan:

The Makah Indians inhabit the region of Cape Flattery, at the entrance to the Strait of Fuca, Washington Territory, reserved for them under the "treaty of Neah Bay," in 1855. They are of medium height, with a good development of muscle, some of them being well proportioned and of unusual strength. Some have black hair, very dark brown eyes, and dark copper-colored skin; others have reddish hair, and a few have flaxen locks, light-brown eyes and fair skin, which may be attributed to an admixture of white blood of Spanish and Russian stock.† Their tribal name is "Kwe-nait-che-chat."

All matters pertaining to the government of this tribe are submitted to a council, at which the opinions of the old men usually prevail, though the women are permitted to speak on subjects pertaining to their rights or in which they are concerned. Formerly the strongest chief, possessed of the most friends and the greatest influence, governed the tribe, but at present, notwithstanding there are several in every village who claim to be descendants of chiefs, their power as rulers is not recognized, though they are treated as belonging to the aristocracy, and are listened to in council. They are also invited to the feasts when councils are held, receive a share of all presents, and their proportion of whales.

The Makahs are temperate, perhaps from a virtue of necessity, as the sale of intoxicating liquors is prohibited on the reservation. They are not active in vocations or pursuits other than fishing and whaling, and obtain some of their supplies by barter from neighboring tribes and white men. They devote very little time to agricultural pursuits or to the capture of land animals, but excel in the management of canoes, making long voyages from land for fish, and fearlessly attacking the whale. They manufacture their own fishing apparatus, and take es-

---

* Smithsonian Contributions to Knowledge, 220.

† "In Holmberg's work will be found an account of the wreck of a Russian ship, the survivors of whose crew lived several years among the Makahs. As late as 1854 I saw their descendants, who bore in their features unmistakable evidence of their origin." —*George Gibbs.*

pecial pains with their harpoons and lances, for which instruments they have the greatest regard. The principal implements used by the Makah whalers are harpoons, lances, ropes, and buoys. The harpoon-heads were formerly made of shell, but at present are of sheet copper or steel, with barbs of elk or deer horn, tightly seized to the blades by cords or strips of bark, the whole being covered with spruce gum. The laniards attached to the harpoon are made of the sinews of the whale twisted into a rope and served with fibers of nettle. The lances are made of metal, with sockets for the ends of the poles. The poles for the harpoons and lances are heavy and unwieldy, but durable and strong. The buoys are made of seal skin with the hair inside, inflated when used and attached to the harpoon-laniards. These buoys are used for the double purpose of impeding the progress of the whale, so as to enable the Indians to kill it, and to prevent the animal from sinking when dead. The ropes used in towing whales ashore are made from the tapering limbs of the cedar and the long fibrous roots of the spruce. They are cut in lengths of three or four feet, and roasted or steamed in ashes, a process which renders them tough, pliable, and easy to split. They are then reduced to fine strands with knives, twisted, and made into ropes by being rolled between the palm of the hand and the naked thigh. All whaling implements that have been used in the capture are regarded with especial favor and handed down from generation to generation, and it is deemed unlucky to part with them. These Indians did not acquire the art of whaling from white men, and still employ the apparatus and processes which have come to them through countless generations. One point deserves especial consideration. The process of wrapping their harpoon-laniards, commonly known as "serving," has been in use by all sea-faring men for a number of years. The Makah Indian has his "serving-stick" and mallet, manufactures his twine from the fibers of the nettle, and "serves" his lines as neatly as do the fishermen of the eastern coast, and it is said they were familiar with the process before the advent of the whites.

The principal articles manufactured by the Makahs are canoes, whaling implements, conical hats, bark mats, fishing-lines, fish-hooks, knives, daggers, bows and arrows, dog-hair blankets, &c. Their largest and best canoes are made by the Clyoquots and Nittinats on Vancouver Island. Canoes of the medium and small sizes are made by the Makahs from cedar, procured a short distance up the Strait or on the Tseuss River. Before the introduction of iron tools the labor of making canoes was attended with many difficulties, the Indian hatchets being made of stone and the chisels of mussel shells ground to a sharp edge with pieces of sandstone. Naturally it required much time and labor to fell a large cedar, and it was only the wealthy chiefs, owning a number of slaves, that attempted such large operations. The tree was literally chipped away with their stone hatchets, or gnawed down after the fashion of beavers. After felling the tree many months were consumed in

shaping the canoe. At present, however, they possess rude axes for rough hewing, and a peculiar form of chisel which may be used like a cooper's adze. Still, the process is very slow. The Indian is guided solely by the eye in modeling his canoe, and seldom, if ever, uses a measure of any kind, yet his lines are perfect and graceful. He also bends the wood, when necessary, by steaming it. The inside of the log is filled with water, which is heated with red-hot stones, a slow fire being made on the outside, near enough to warm the cedar without burning it. As the projections for the head and stern pieces cannot be cut from the same log, they are carved from separate pieces and "scarfed" by means of cedar withes held in their places by wooden pegs. The joints by this process are so perfectly matched as to be water-tight without calking. When the canoe is finished the interior is painted with a mixture of oil and red ocher. Sometimes charcoal and oil are rubbed on the outside, but more commonly it is simply charred, the surface being rubbed smooth with grass or cedar twigs. The paddles are made of yew, and are usually procured from the Clyoquots. The blade is broad, but tapers at the point. The paddles are also blackened by charring them in the fire, and afterwards polished. The sails were formerly made of mats of cedar bark, and such are still used by some of the Clyoquots, though some of the tribes in the vicinity now use cotton sails. The usual form is square, with yards at top and bottom, and the sail may be rapidly hoisted or lowered by means of a line which passes through a hole in the top of the mast. By rolling the sail around the lower yard it can be let out or shortened, as the occasion may require. Some of the Indians have adopted sprit-sails, but they are not in general use.

Blankets, which constitute the principal item of wealth, are made of feathers or down, of dog's hair, and of cedar bark. The manufacture of mats is the principal employment of the females during the winter, and for this purpose cedar bark is chiefly used. Baskets of various kinds are also made of this bark, but those intended for carrying heavy weights are made from spruce roots. Conical hats for the Indians are made of spruce roots split into fine fibers and plaited so as to be impervious to water, and painted of a black ground with red figures. The black is produced by grinding bituminous coal with salmon eggs, which are chewed up and spit on a stone. The hats sold to white men, however, resemble the common straw hat, and are made of spruce roots, some being of a plain buff color, while others have woven designs of various kinds. Recently they have commenced to cover bottles or vials with basket-work, for sale to seekers of Indian curiosities. Their fishing and whaling capes are made something like a "poncho," from cedar bark or from strips of cloth or old blankets. Their bows are usually made from yew, principally by the boys, and the arrows from split cedar. The arrow-heads are made of pieces of wire, bone, wood and bone combined, iron, or copper. The prongs of the bird-spears are made either

of wood or bone, and the barbs of the fish-spears of iron or bone. The manufacture of whaling implements, particularly the harpoon poles and heads, is confined to individuals who dispose of them to the others. None of the Indians seem to have regular trades, yet the most expert confine themselves to certain branches. Some are skillful in working iron and copper, others in carving or painting, while others, again, are more expert in catching fish or killing whales.

The Indians do not understand the art of manufacturing pottery, although clay is found at Neah Bay. Their ancient utensils for boiling were simply wooden troughs, and the method of cooking in them was by hot stones. These troughs are used by many at present, especially on occasions of feasting, when a large quantity of food is necessary; but for ordinary purposes iron pots, brass kettles, and tin pans, which have been purchased from white traders, are used. Vessels for carrying water, and boxes for containing blankets or clothing, are made from boards, bent, when necessary, by the application of warm water; but these are manufactured principally by the Clyoquot Indians, very few being made by the Makahs. Wooden bowls and dishes, and chopping trays, are made from alder; but some of the bowls are made of knobs taken from decayed logs of maple or fir. Fishing-lines are made of kelp stems; halibut hooks from hemlock knots—whale sinew being used for tying on the bait. The barbs of the codfish hooks are made from bone, lashed to wooden shanks, for the capture of small fish, such as perch and rock. Small pieces of bone, sharp as needles at both ends, known as "gorge hooks," are seized in the middle by lines of sinew. The fish-club is usually a rough piece of wood, though sometimes rudely carved. In the manufacture of their tools the Makahs use a large stone for an anvil and a smaller one for a hammer. Their knives, which are employed either as weapons of defense or for cutting blubber or sticks, are made of rasps and files, the handles being made of bone and sometimes ornamented with brass or copper. The Makahs understand the art of tempering their knives. The chisels are made of rasps or any other kind of steel. The instruments for boring holes are simply pieces of iron or steel wire, flattened at the point and sharpened, with a rough stick as a handle. Cutting with a knife of any kind, or with a chisel, is done by working toward, instead of from, the person; but when they are so fortunate as to obtain an old plane they work it in the regular way. They also manufacture small knife-blades, which are inserted into wooden handles and used for whittling or scarifying their bodies during their medicine or "Ta-ma-na-was" performances. The common hammer is simply a stone; others used to drive wedges are manufactured with more care and in the form of a pestle.

Before the advent of the white man these Indians used dried halibut in place of bread, oil in place of butter, and blubber instead of beef or pork. When potatoes were introduced they formed a valuable addition to the food of the Indians; and since the white men have become

more numerous the Indians have accustomed themselves to other articles of diet, such as flour, hard bread, rice, and beans, which are always acceptable to them. They are also fond of molasses and sugar, for which they are ever anxious to trade their furs, oil, or fish. Next in importance to the halibut are the salmon and a species of fish known as the "cultus," or bastard cod, which are usually eaten fresh except in seasons of great plenty, when the salmon are smoked. They capture all of the fish with the hook, using herring as bait. The squid is used as food and also as bait for halibut. Skates, though abundant, are seldom eaten, because they make their appearance during the halibut season. Three varieties of *Echinus* are abundant and eaten in great quantities. Mussels, barnacles, crabs, sea-slugs, perriwinkles, and limpets furnish occasional repasts. Scallops are excluded from their list of food, but their shells are used as rattles in ceremonials. Although oysters are found in the bays and inlets of Vancouver Island the Indians do not eat them.

Of land animals they eat the flesh of the elk, deer, and bear; but smaller animals, such as raccoons, squirrels, and rabbits, are seldom, if ever, eaten by them, and are killed only for their skins. They are particularly fond of sea-fowl, including pelicans, loons, cormorants, ducks of several kinds, grebes, and divers of various sorts. The roots of certain ferns, some species of meadow grass, water-plants, and several kinds of sea-weed, particularly eel-grass, are also used as food, as well as the young sprouts and fruit of the "salmon berry" and "thumb berry." Their method of serving up food is very primitive, the same forms being observed by all. The food is served in courses, and, when feasts are given, the guests are expected to carry away what they cannot eat. The host is offended if his guests do not partake of everthing that is placed before them, and if strangers are among the visitors it is not uncommon for four or five feasts to be given in the course of a single day or evening. An Indian is looked upon as a welcome guest who does justice to the hospitality of his host, and, in order that he may not offend any one, thrusts his fingers down his throat and throws off a load from his stomach to enable him to be prepared for the next feast. Although smoking is not universally practiced among them, they sometimes indulge in a whiff of tobacco mixed with dried leaves, after eating, fishing, and whaling. The "pipe of peace" is unknown among them.

Dog-fish are taken in large quantities for the oil contained in the liver, which forms the principal article of traffic between these Indians and the whites. But the fish itself is seldom eaten by the Makahs, unless the oil has been thoroughly removed. Dog-fish oil has a nauseous taste, and is not relished by these Indians, who are epicures in their way and prefer the oils of whales and seals. A very large species of shark, known among whalemen as "bone-shark," is occasionally killed by the Makahs on account of the great quantities of oil found in the liver. A fish of the genus *Anarrhichthys*, called the "doctor-fish," is

only eaten by the medicine men. Porpoises are highly esteemed for food. Seals also abound. The skin of the hair-seal is taken off whole, blown full of air, and dried with the hair side in. It is used as a buoy in the capture of the whale, and is usually painted on the outside with rude devices in red, vermilion, or ocher. The seals, though sometimes killed with spears, are often shot with guns; but when they congregate during the breeding season, the Indians approach them with torches and clubs and kill numbers by knocking them on the head. The flesh of all the species of seal is eaten, and the skins of the fur-seals are sold to the whites.

The abundant supply of marine food, and the ease with which the Indians can obtain their subsistence from the ocean, makes them improvident in laying in supplies, with the exception of halibut, for winter use. On any day during the year, when the weather is favorable, they can procure provisions enough in a few hours to last them for several days.

The usual dress of the men consists of a shirt and blanket, the old men being content with the blanket only. Nearly all of them, however, have suits of clothing obtained from white persons, but these are only worn on arrival of strangers or when the Indians work for the whites, and they usually take them off at night, when they return to their lodges. During rainy weather they wear, in addition to blankets, conical hats and bear-skin cloaks. When whaling, they wear a bear-skin thrown over the shoulders; and when fishing, a small cape made from the fibers of bark. The women usually wear a shirt or long chemise, reaching from the neck to the feet; and some of them have, in addition, calico shirts tied as petticoats around their waists, or petticoats made of blankets or other coarse material. Formerly their dress was merely a blanket and a cincture of fringed bark reaching from the waist to the knees. The young women of the present day sometimes dress themselves in calico gowns or plaid shawls of bright colors. They also wear glass beads of various colors and sizes about their neck and ankles, with perhaps a dozen or more of bracelets made of brass wire around each wrist, nose and ear-ornaments composed of shells, beads, and strips of leather, and paint their faces with grease and vermilion. Both sexes wear nose-pendants, usually made from small pieces of *Haliotis* shell. The men wear their hair long; but when whaling they tie it up in a knot behind the head. They also decorate themselves by winding wreaths of evergreens around the knob of hair, or stick in sprigs of spruce and feathers. This head-dress is sometimes varied by substituting a wreath of sea-weed, or a bunch of cedar bark in the form of a turban. They paint their faces either black or red, or in stripes of various colors.

The Makahs claim that they were created on the Cape, and that animals were first produced. The first men sprang from an intimate intercourse of a star, which fell from heaven, with some of the animals; and from their offspring came the races of Nittinats, Clyoquots, and Makahs.

They believe that all living things—trees, birds, fishes, and animals—were formerly Indians, who, on account of their wickedness, were transformed into the shapes in which they now appear. They also believe that two men, "brothers of the sun and moon," and termed "Ho-hó-e-ap-béss," or the "men who change things," came on earth and made the transformation. The seal was a pilfering Indian, and therefore his arms were shortened and his legs tied so that he could only move his feet. He was cast into the sea and told to catch fish for his food. The mink was a great liar, and full of rascalities which he practiced on every one. The blue-jay was the mother of the mink. The raven was a strong Indian fond of flesh, and, in fact, a sort of cannibal; and the crow was his wife. The crane was a great fisherman. The king-fisher was also a fisherman, but a great thief. He stole a necklace made of shells, and this accounts for the ring of white feathers about his neck.

The Makahs, in common with all the coast tribes, hold slaves. In former times it is said the slaves were treated very harshly, and their lives were of no more value than those of dogs. The treaty between the United States and the Makahs makes it obligatory on this tribe to free their slaves, and although this provision has not thus far been enforced, it has had the effect of securing to the latter better treatment than they formerly had. Sometimes the master marries his slave woman, or a mistress takes her slave man as her husband; the offspring in such cases are regarded as half-slaves, and though some of them have acquired wealth and influence among the tribe, yet the fact that their fathers or mothers were slaves is considered as a stigma not to be removed for several generations. The slaves appear to have no task-work assigned them, but pursue the same avocations as their masters. The men assist in the fisheries, and the women manufacture mats and baskets or engage in domestic duties. Before the reservation was placed under the charge of an agent of the Government, it was considered degrading for a chief or the owner of slaves to perform any labor except to hunt, fish, or kill whales, but latterly no distinction is made between master and slave, but both are treated alike.

They keep little record of time, but have names for the different months, or "moons," twelve of which constitute two periods, the warm and cold. They remember and speak of a few days or of a few months, but of years, according to our computation, they know nothing. Their "year" consists of six "moons." The first of these periods commences in December, when the days begin to lengthen, and continues until June, when, as the sun recedes and the days shorten, another period commences and lasts until the shortest days. The seasons, however, are recognized by them as they are by ourselves, namely, spring, summer, autumn, and winter. The names of the months are as follows:

December is called the "moon" in which the chet-a-pook, or the California gray whale, makes its appearance.

January is the "moon" in which the whale has its young.

February, the "moon" when the weather begins to grow better and the days are longer, and when the women begin to venture out in canoes after firewood without the men.

March, the "moon" when the finback whales arrive.

April, the "moon" of sprouts and buds.

May, the "moon" of the strawberry and "salmon-berry."

June, the "moon" of the red huckleberry.

July, the "moon" of wild currants, gooseberries, etc.

August is a season of rest. No fish are taken or berries picked, except occasionally by children or idle persons.

September, work of all kinds commences, particularly cutting wood, splitting boards, and making canoes.

October is the "moon" for catching the "tsa-tar-wha," a variety of rock-fish, by means of a trolling-line, with a bladder buoy at each end and a number of hooks attached.

November is the season of winds and screaming birds.

The winds are the breath of fabulous beings who reside in the quarters whence they come, representing the different points of the compass. The Indians are excellent judges of the weather and can predict a storm or calm with almost the accuracy of a barometer.

Both males and females are passionately fond of gambling, and continue their games for days at a time, or until one party or the other loses all it has. They have several kinds of gambling instruments; and one game in particular, common to all the Indians of this Territory, and called in their jargon "la-hull," is played with disks made of hazel-wood, conclusions being arrived at by guessing, as is the case in the majority of their games. Another game consists in passing a stick rapidly from hand to hand, the object being to guess in which hand it may be. A third game is played by females, with four beaver teeth, marked on one side and plain on the other, which are thrown like dice.

When a Makah dies the body is immediately rolled in blankets and firmly bound with ropes and cords, then doubled up in the smallest compass and placed in a box, which is also firmly bound with a rope. A portion of the roof is removed, and the box with the body is taken out at the top of the house and lowered to the ground, from a superstition that if a dead body is carried through a door-way any person who passes through it afterwards will immediately sicken and die. It was formerly the custom to deposit the body in a tree, but of late years it has been buried in the earth, with a portion of the property of the deceased placed on top of the box. If a man, his fishing or whaling-gear, gun with lock removed, or his clothing and bedding are buried with him. If a woman, her beads, bracelets, calico garments and other wearing apparel, and baskets are buried with her. A little earth is thrown on the box and property, and the space filled in with stones. The grave is then decorated with blankets, calico shawls, handkerchiefs, looking-glasses, crockery, tin-ware, and implements used in digging the grave.

No particular order is observed in the arrangement of these articles, but they are usually placed according to the fancy of the relatives of the deceased.

Several varieties of the whale are taken at different seasons, some being captured, and others, including the right whale, drift ashore, having been killed by whalemen, sword-fish, or other agencies. The California gray whale is the kind usually captured by the Makahs, the others being rarely attacked. Among the various species of whales found off this coast may be mentioned the sperm-whale, which is rarely seen, the right whale, sulphur-bottom, finback, blackfish, killer, and as just referred to, the California gray whale.

As the method of whaling peculiar to these Indians forms the most important topic in connection with this paper, I quote herewith at length from Mr. Swan. He says:

"Their method of whaling, being both novel and interesting, will require a minute description—not only the implements used, but the mode of attack and the final disposition of the whale being entirely different from the practice of our own whalemen. The harpoon consists of a barbed head, to which is attached a rope or lanyard, always of the same length, about 5 fathoms, or 30 feet. This lanyard is made of whale's sinews twisted into a rope about an inch and a half in circumference, and covered with twine wound around it very tightly, called by sailors "serving." The rope is exceedingly strong and very pliable.

"The harpoon-head is a flat piece of iron or copper, usually a saw-blade or a piece of sheet copper, to which a couple of barbs made of elk's or deer's horn are secured, and the whole covered with a coating of spruce gum. The staff is made of yew in two pieces, which are joined in the middle by a very neat scarph, firmly secured by a narrow strip of bark wound around it very tightly. I do not know why these staves or handles are not made of one piece; it may be that the yew does not grow sufficiently straight to afford the required length; but I have never seen a staff that was not constructed as here described. The length is eighteen feet; thickest in the center, where it is joined together, and tapering thence to both ends. To be used, the staff is inserted into the barbed head and the end of the lanyard made fast to a buoy, which is simply a seal-skin taken from the animal whole, the hair being left inwards. The apertures of the head, feet, and tail are tied up air-tight and the skin inflated like a bladder.

"When the harpoon is driven into a whale the barb and buoy remain fastened to him, but the staff comes out, and is taken into the canoe. The harpoon which is thrown into the head of the whale has but one buoy attached, but those thrown into the body have as many as can be conveniently tied on; and, when a number of canoes join in the attack, it is not unusual for from thirty to forty of these buoys to be made fast to the whale, which, of course, cannot sink, and is easily dispatched by their spears and lances. The buoys are fastened together by means

of a stout line made of spruce roots, first slightly roasted in hot ashes, then split with knives into fine fibers, and finally twisted into ropes, which are very strong and durable. These ropes are also used for towing the dead whale to the shore. The harpoon-head is called kwe-paptl; the barbs, tsa-kwat; the blade, kūt-só-wit; the lanyard attached to the head, klūks-ko; the loop at the end of the lanyard, kle-tait-lĭsh; the staff of the harpoon, du-pói-ak; the buoy, dōpt-kó-kuptl; and the buoy-rope, tsis-ka-pūb.

"A whaling canoe invariably carries eight men: one in the bow, who is the harpooner, one in the stern to steer, and six to paddle. The canoe is divided by sticks, which serve as stretchers or thwarts, into six spaces, named as follows: The bow, he-tuk-wad; the space immediately behind, ka-kai-woks; center of canoe, cha-t′-hluk-dōs; next space, he-stuk′-stas; stern, kli-chá. This canoe is called pa-dau-t′-hl. A canoe that carries six persons, or one of medium size, is called bo-kwis′-tat; a smaller size, a-tlis-tat; and very small ones for fishing, te-ka-aú-da.

"When whales are in sight, and one or more canoes have put off in pursuit, it is usual for some one to be on the look-out from a high position, so that in case a whale is struck a signal can be given and other canoes go to assist. When the whale is dead it is towed ashore to the most convenient spot, if possible to one of the villages, and hauled as high on the beach as it can be floated. As soon as the tide recedes, all hands swarm around the carcass with their knives, and in a very short time the blubber is stripped off in blocks about two feet square. The portion of blubber forming a saddle, taken from between the head and dorsal fin, is esteemed the most choice, and is always the property of the person who first strikes the whale. The other portions are distributed according to rule, each man knowing what he is to receive. The saddle is termed u-butsk. It is placed across a pole supported by two stout posts. At each end of the pole are hung the harpoons and lines with which the whale was killed. Next to the blubber at each end are the whale's eyes; eagle's feathers are stuck in a row along the top, a bunch of feathers at each end, and the whole covered over with spots and patches of down. Underneath the blubber is a trough to catch the oil which drips out. The u-butsk remains in a conspicuous part of the lodge until it is considered ripe enough to eat, when a feast is held, and the whole devoured or carried off by the guests, who are at liberty to carry away what they cannot eat. After the blubber is removed into the lodge the black skin is first taken off, and either eaten raw or else boiled. It looks like India rubber; but though very repulsive to the eye it is by no means unpalatable, and is usually given to the children, who are very fond of it, and manage to besmear their faces with the grease till they are in a filthy condition.

"The blubber, after being skinned, is cut into strips and boiled, to get out the oil that can be extracted by that process; this oil is carefully skimmed from the pots with clam-shells. The blubber is then

hung in the smoke to dry, and when cured looks very much like citron. It is somewhat tougher than pork, but sweet (if the whale has been recently killed), and has none of that nauseous taste which the whites attribute to it. When cooked it is common to boil the strips about twenty minutes, but it is often eaten cold and as an accompaniment to dried halibut.

"From information I obtained I infer that formerly the Indians were more successful in killing whales than they have been of late years. Whether the whales were more numerous, or that the Indians, being now able to procure other food from the whites, have become indifferent to the pursuit, I cannot say; but I have not noticed any marked activity among them, and when they do go out they rarely take a prize. They are more successful in their whaling in some seasons than in others, and whenever a surplus of oil or blubber is on hand it is exchanged or traded with Indians of other tribes, who appear quite as fond of the luxury as the Makahs. The oil sold by these whalers to the white traders is dog fish oil, which is not eaten by this tribe, although the Clyoquot and Nootkan Indians use it with their food. There is no portion of a whale, except the vertebræ and offal, which is useless to the Indians. The blubber and flesh serve for food; the sinews are prepared and made into ropes, cords, and bowstrings, and the stomach and intestines are carefully sorted and inflated, and, when dried, are used to hold oil. Whale oil serves the same purpose with these Indians that butter does with civilized people; they dip their dried halibut into it while eating, and use it with bread, potatoes, and various kind of berries. When fresh it is by no means unpalatable; and it is only after being badly boiled, or by long exposure, that it becomes rancid, and as offensive to a white man's palate as the common lamp oil of the shops."

MAKAH INDIANS.

WHALING IMPLEMENTS EMPLOYED BY THE INDIANS OF CAPE FLATTERY, COLLECTED BY JAMES G. SWAN.

[Compiled from explanatory notes accompanying the objects.]

CAPTURING THE WHALE.

HARPOONS.

HEADS AND LANIARDS.

HARPOON HEAD AND LANIARD.

Head, apparently a piece of an old saw blade, covered with a coating of spruce gum. Laniard, sinews of the whale served with twine made from fibers of nettle to render it impermeable to water. Barbs, elk bone; sheath, bark. Length, 20 feet. Makah Indians, Cape Flattery, 1883. 72635. James G. Swan. Used by natives for fastening seal-skin buoys to whales.

HARPOON HEAD AND LANIARD.

Head made of piece of sheet-brass; barbs, elk-bone, ornamented, covered with a coating of spruce gum. Laniard, sinews of the whale neatly *laid up*, and served with twine to keep out water, which is injurious to the fibers. Sheath, bark. Makah Indians, Cape Flattery, 1883. 72634. James G. Swan. The harpoons formerly used by these Indians were made of mussel shells; at present of copper sheathing, brass, or old saw-blades. The serving for the laniards was formerly made exclusively from the fibers of the nettle, which are also used now by the old men; and though the young men, in some instances, use cotton twine, yet they prefer the nettle. A harpoon that has been successfully used acquires additional value.

HARPOON AND LANIARD.

Harpoon and line attached to pole and seal-skin buoy, showing the manner in which the apparatus is rigged when used. Head-piece of sheet brass. Laniard, whale-sinew, served with twine made from the fibers of the nettle. Makah Indians, Cape Flattery. 72752. James G. Swan. The harpoon is not permanently fastened to the staff; it is, however, connected with the buoy by means of a laniard. When the harpoon is thrust into the whale, the staff is withdrawn and taken into the canoe, and the animal is incumbered with the buoy. A harpoon with one buoy attached is thrown into the head of the whale, but the harpoon thrown into the body has as many buoys as can

HARPOON AND LANIARD—Continued.

conveniently be tied on; and, when a number of canoes join in the attack, it is not unusual for from thirty to forty of these floats to be made fast to one whale, which, of course, cannot sink, and is easily dispatched by the spears and lances. The Indians did not acquire the art of whaling from white men; it has been handed down through countless generations. The same kind of apparatus has also been in use for many years.

HARPOON-POLES.

HARPOON-POLE.

A heavy, unwieldy pole made of yew (*Taxus brevifolia*), scarfed in three places, and served with strips of wild-cherry bark. One end tapers to a point for the reception of harpoon-socket. Used by natives in thrusting the harpoon into the whale to make fast the seal-skin buoys. Length, 15 feet. Makah Indians, Cape Flattery, 1883. 26825. James G. Swan. An implement for which the Makah whaler has a special regard. It is seldom used without being broken; it is then repaired, and acquires additional value. I saw one with six places where it had been repaired, and the owner would not part with it for any price. It was difficult to get the one now sent, although they were perfectly willing to make me new ones, but had no yew. Some of these harpoon staffs which have been in the same family for many generations could not be purchased, from a superstition that it would be unlucky.

IMPEDING THE PROGRESS OF THE WHALE.

FLOATS.

SEAL-SKIN BUOY.

Skin of the hair-seal used by natives in the capture of the whale. Indian name, "Do-ko-kuptl." New. Length, 36 inches. Makah Indians, Cape Flattery, 1883. 72629. James G. Swan.

SEAL-SKIN BUOY.

Skin of hair-seal, small stationary wooden toggle at either end for holding eye-splice of harpoon-line. Small laniards made of fibers of spruce roots, for *making fast* to other buoys. Indian name, "Do-ko-kuptl." Length, 38 inches. Makah Indians, Cape Flattery, 1883. 72630. James G. Swan. Inflated and attached to the harpoon, showing the manner in which the apparatus is used during the capture. A number of buoys being made fast to the whale prevents its progressive motions, thus affording the natives an opportunity to kill it with the lance (72674).

SEAL-SKIN BUOY.

Skin of hair-seal used by natives in the capture of the whale. Indian name, "Do-ko-kuptl." Old. Length, 34 inches. Makah Indians, Cape Flattery, 18—. James G. Swan.

KILLING THE WHALE.

LANCE-HEADS.

LANCE-HEAD.

New. Indian name, "Kathlat-te-uk." Head, steel; socket, wood, served with bark strips. Covered with a coating of spruce gum. Length, 7 inches. Makah Indians, Cape Flattery, 1883. 72639. James G. Swan. Used with a long pole (72674), and when thrust into a whale the lance becomes detached, and is recovered when the whale is cut up. A lance-head that has been successfully used acquires additional value, and for some of them the Indians ask a fabulous price.

LANCE-HEAD.

An old lance-head formerly the property of Haiks, at one time a chief of the Neah Bay. He made it many years ago from a piece of a musket-barrel. It was highly prized by the relatives. An ingenious and simple device. Piece of gun-barrel hammered into the shape of a lanceolate blade, the rear portion of barrel serving as a socket. Indian name "Kathlat-te-uk." Length, 7 inches. Makah Indians, Cape Flattery, 1882. 72640. James G. Swan. Attached to lance-pole and used in killing whales. Thrust into the most vulnerable parts of the whale; the pole is withdrawn, and the head regained when the whale is cut up. Lances that have been used are greatly enhanced in value.

LANCE-POLES.

LANCE-POLE.

Long, heavy, and unwieldy pole, with separate pieces serving as *shanks* seized to either end. Lance-head attached. The form of this staff, with its long, tapered point, is to enable the Indian to thrust it as deeply as possible into the most vulnerable parts of the whale. After a sufficient number of skin-buoys have been fastened to the whale to prevent it from remaining under water, and when it is nearly exhausted from the harpoons which have been thrust into it, an Indian places himself in the bow of the canoe with his face towards the stern; the canoe is then paddled alongside the whale, and, standing up with one foot on the thwart and the other on the gunwale of the canoe, the Indian raises the staff high above his head and thrusts the lance as deep into the whale as he can, using his utmost force. The heart is the place aimed for, and, if successful, the lance-

LANCE-POLE—Continued.

head being detached remains, and the animal dies at once. If a vital portion is not struck at first, other lance-heads are thrust in until the death wound is given. The whale is towed ashore, cut up, and the lance-head secured. Length, 20 feet 4 inches. Makah Indians, Cape Flattery, 1883. 72674. James G. Swan.

TOWING WHALES ASHORE.

TOW-LINES.

TOW-LINE.

Small tow-line, "ses-tope," made of fibers of spruce roots. Used by natives for towing the whale ashore. Port Townsend, Washington Territory. 72633. James G. Swan. Makah Indians, Cape Flattery.

TOW-LINE.

Small size. Indian name "ses-tope." Made of spruce roots (*Abies Douglasii*). The process of manufacture consists in (1) roasting the material in hot ashes; (2) splitting with knives into fine fibers; and (3) twisting the fibers into a rope. Durable and strong. Makah Indians, Cape Flattery, 1883. 72631. James G. Swan. Used by natives in towing whales ashore.

TOW-LINE.

New. Large size. Made of fibers of spruce roots (*Abies Douglasii*). The long slender roots are first roasted in the ashes, then split into fine strands with knives, twisted, and laid up into ropes by hand. These ropes are beautifully made, exceedingly strong, and buoyant. The Indians not only understand the art of rope-making by hand as well as the whites, but they can also *knot* and *graft* a rope as well as white sailors. Makah Indians, Cape Flattery, 1883. 72632. James G. Swan. Used by natives for towing whales ashore.

PADDLES.

WHALING PADDLE.

Made of yew; the common form adopted by the natives in whaling. The paddle has a long, tapering point to enable the canoe to silently approach a whale, as the blade can be thrust deep in the water and the reverse stroke made with comparatively little splashing or noise. Length, 5 feet. Makah Indians, Cape Flattery, Washington Territory. 72676. James G. Swan.

WHALEMAN'S CLOTHING.

BEAR-SKIN CLOAK.

Indian name, "Artleitquitl." Worn by natives when whaling or fishing, or in wet weather on shore. 74 by 43 inches. Makah Indians, Cape Flattery, 1883. 72693. James G. Swan.

PRODUCTS OF THE WHALE.

BALEEN.

Nine slabs of whalebone from the sulphur bottom whale. Makah Indians, Neah Bay, Washington Territory. 72692. James G. Swan.

IMPLEMENTS USED IN THE CAPTURE OF THE SEAL.

SPEARS, HEADS, AND LANYARDS.

SEAL SPEAR.

A slender staff or pole, with two prongs of unequal lengths upon which are placed respectively two metal heads with one barb each. The spear-heads are held in place by laniards which are hauled taut and firmly grasped with the pole in the left hand. When used the ends of the laniards are attached to a long line, one end of which remains in the boat. The butt of the pole is provided with a flaring piece of wood which is used as a finger-rest when the Indian thrusts the instrument into the seal. Length, 15 feet 10 inches. Makah Indians, Neah Bay, Washington Territory. 72671. James G. Swan. Used by the natives in killing fur seals. The canoe is paddled silently to a short distance from the sleeping seal, and the spear thrust forcibly into the animal. The canoe is hauled by means of the rope closer to the seal, which is dispatched by a blow on the head with a club. The Indians invariably smash in the skull of a seal even when the animal is killed by the thrust of the spear, which is frequently the case. So universal is this practice that I was unable, during a residence of three years at Neah Bay, to obtain a perfect specimen of a skull, although hundreds of skulls may be seen on the beach any day during the sealing season, but every one was fractured. [JAMES G. SWAN.]

STAFF FOR SEAL SPEAR.

Slender pole with two prongs, without spears, and finger-rest at rear end. Used for killing seal. Length, ———. Makah Indians, Cape Flattery, 1883. 72670. James G. Swan.

RECEPTACLES FOR SEALING IMPLEMENTS.

BASKET.

A large basket, "Kla-ash," used by natives for holding spear-heads, harpoons, and lines, when sealing. Length, 28 inches. Port Townsend, Washington Territory, January, 1883. 72665. James G. Swan. These baskets are never offered for sale. The prices asked for them, when a native is induced to sell, exceed those for the ordinary baskets.

BASKET.

A small basket, "Kla-ash," used as a receptacle for spear-heads by natives when engaged in killing seal. Length, 15½ inches. Makah Indians, January, 1883. 72664. James G. Swan.

BASKET.

Basket used to hold spear-heads and other small articles when sealing—called by the Makahs, "Kla-ash." A very fine specimen. Double, made for a chief, and was procured as a special favor. Such baskets are never offered for sale. After having been used they acquire additional value, and to sell one is deemed unlucky. This being new, was more easily obtained. Length, 19 inches. Makah Indians, Cape Flattery, 1883. James G. Swan.

ACCESSORIES.

SERVING LANIARDS.

SERVING STICK AND TWINE.

Stick, yew; twine, nettle fiber. Ends of stick carved to represent the caudal fin of the whale. Used in connection with the mallet (76638) to serve harpoon laniards. Length, 16½ inches. Makah Indians, Cape Flattery, 1882. 72637. James G. Swan. By means of this implement and the mallet, twine is wound or wrapped around the harpoon lines in spiral folds in the same manner as ordinary seamen *serve* a rope with spun-yarn or marline. The Indians employed this process before the advent of the white man. The necessities of the case caused them to adopt a plan at once simple and effective. "This *stick* has been in the family from which it was procured more than four generations. It was the property of Chief Haiks, who died at Neah Bay thirty years ago. His whaling implements have been carefully preserved and never used since his death."—[J. G. SWAN.]

SERVING MALLET.

Indian name, "Kla-ta-bup." Small wooden mallet, square ends, longitudinal groove in upper surface; used with the *serving stick* (72637) in wrapping the sinew rope, for harpoon laniards, with twine; usually made from the fibers of nettle. Length, 6 inches. Makah Indians, Cape Flattery, 1882. 72638. James G. Swan.

MANUFACTURE OF TWINE.

BARK.

Inner bark of white cypress (*Cupressus nukatensis*), from which is manufactured the twine used in whaling, as well as soft beds for infants. Small package; length, 5 inches. Makah Indians, Cape Flattery. 72641. James G. Swan. When a harpoon

BARK—Continued.

with one buoy attached has been darted into a whale, another buoy is immediately attached to the laniard of the first, the operation being repeated until a sufficient number of floats have been bent on. It is also often necessary to detach some of the buoys to make them fast to other harpoons and buoys. The twine made from cypress bark is especially well adapted for this purpose, as it breaks easily when wet, and quickly releases the buoys, which would not be the case with other kinds of twine.

IMPLEMENTS USED BY ESKIMO TRIBES IN THE CAPTURE OF THE SEAL, WALRUS, AND WHALE.

ESKIMO HARPOONS.

ESKIMO WHALING-HARPOON.

Pole, wood; ivory tip recessed for walrus ivory spear or shank, which is lashed to the pole with thongs of raw hide. Length, 8 feet 3 inches. Northeast coast. 10265. Smithsonian Institution.

SEAL-HARPOON.

Eskimos. Igloolik. 10400. Captain C. F. Hall.

ESKIMO HARPOON.

Pole, wood; iron spur and ferule at butt; shank, iron; harpoon, ivory (lily iron); point tipped with iron; recessed for end of shank; rigid eye for line; line, seal-skin; sheath, wood. Length, 8 feet 5½ inches. Eskimos, Greenland. 19518. George Y. Nickerson. An improved whaling-harpoon made by natives, evidently, in part, from material obtained from a whaling-vessel.

WHALING-HARPOON.

Pole, wood; tipped with ivory. Ivory point fitting in recessed tip of pole, and seized to the handle with thongs of walrus-hide. Length, 8 feet. Eskimos, Greenland. 19519. George Y. Nickerson.

ESKIMO WHALING-HARPOON.

Pole, wood; butt-piece, ivory; inserted in a recess in the butt, and riveted with native copper. Grip, ivory; pole tipped with ivory, recessed for a spear or shank, 18½ inches long, made of walrus ivory, and lashed to pole with raw hide. Length, 8 feet 7 inches. Cumberland Gulf. 30008. W. A. Mintzer, U. S. N. May be used in the capture of whale or walrus.

ESKIMO SEAL-HARPOON.

Pole, wood, one inch in diameter; butt recessed to receive a recurved bone spear, which is lashed with seal-skin; ivory peg for grip, lashed to pole with seal-skin; tip mounted with a bulb-like ivory head recessed for shank; shank, ivory, fastened to line with a small seal-skin laniard or becket. Lily-iron, ivory, tipped with iron, rigid eye for line; seal-skin line attached to head. Total length, 9 feet 2 inches. Norton Sound, Alaska. 33888. E. W. Nelson. Combined harpoon and lance, manufactured and used by natives in the capture of seal.

SEAL-HARPOON.

Pole, wood; ivory spear or lance seized to butt with seal-skin; ivory grip; head-piece and shank, walrus ivory; tip of pole served with seal sinews. Harpoon wanting. Length, 9 feet 6 inches. Port Clarence, Alaska. 43429. E. W. Nelson. Harpoon and lance, or spear, combined.

SEAL-HARPOON.

Pole, wood; lance, walrus ivory, seized to butt with seal-thongs; Grip, ivory; carved in imitation of head of seal; tip of pole served with alternate layers of black and transparent strips of baleen; head-piece ivory recessed for ivory shank, lashed to pole with a seal-thong. Harpoon wanting. Length, 11 feet. Golorna Bay, Alaska. 43346. E. W. Nelson. Harpoon and lance combined.

ESKIMO HARPOON.

Handle, wood, tipped with head of an animal carved in bone. Bone shank inserted in recess of tip and lashed with raw-hide. End of handle near tip served with strips of baleen and raw-hide. Small seal-head carved in bone and seized to central part of handle, used as a finger rest, and as a stop for the line. Harpoon butt and head wanting. Total length, 54 inches. Sledge Island. 45415. E. W. Nelson.

ESKIMO HARPOON-HANDLE.

Handle, wood, tipped with bone. Shank, bone, inserted in recessed head of tip, and lashed to handle with hide. Pole in two sections to fit case. Total length, 76 inches. Cape Lisburne, Alaska. 46177. W. H. Dall.

BELUGA-HARPOON OR WHALING STICK.

A light stick half an inch in diameter, with a walrus-ivory tip, carved in the shape of the head of an animal. A wooden plug is inserted in the mouth and recessed for the insertion of the neck or shank. Harpoon, bone tipped with slate. When the beluga is struck the head becomes detached from the shaft. Used in connection with the Throwing Stick. Length, 5 feet. Alaska. 72391. C. L. McKay.

BELUGA-HARPOON SHAFT.

Light wooden stick one-half inch in diameter, tipped with walrus-ivory, carved in shape of a head of an animal. Harpoon wanting. Length, 4 feet 5½ inches. Alaska. 72392. C. L. McKay. Used by natives in connection with the accompanying Throwing Stick (72398) for the capture of the beluga.

BELUGA-HARPOON SHAFT.

Wood, one half inch in diameter, with ornamental head carved in walrus-ivory. Harpoon wanting. Length, 4 feet 4 inches. Alaska. 72393. C. L. McKay. Used by natives in connection with the accompanying Throwing Stick (72398) in the capture of the beluga.

ESKIMO HARPOON-HEADS.

LILY-IRONS.

SEAL-HARPOON HEAD.

Walrus-ivory, with brass tip riveted with native copper. Laniard, raw-hide. Bights in the ends of laniard seized with seal sinew. Length of head, 3 inches. Length of laniard, 40 inches. Cape Lisburne, Arctic Ocean. (3627.) W. H. Dall. Old. Has been used.

HARPOON-HEAD.

Detachable harpoon-head, bone, with iron tip. Length, 6 inches. Eskimo, Cape Espenberg, Kotzebue Sound. (3700.) T. H. Bean.

THREE HARPOON-HEADS OF BONE AND IRON.

Recessed in rear end for poles. Rigid eyes for laniards. Length, $4\frac{7}{8}$, $5\frac{3}{8}$, $5\frac{5}{8}$ inches. Eskimos, Northeast coast. 9838. S. F. Baird.

WALRUS-HARPOON HEAD.

End recessed for pole. Rigid eye for laniard. Length, 5 inches. Eskimos, Igloolik. 10136. Captain C. F. Hall.

PART OF ANCIENT INNUIT HARPOON-HEAD.

Bone. Length, $3\frac{3}{4}$ inches. Repulse Bay. 10404. Captain C. F. Hall.

THREE HARPOON-HEADS.

Ivory, tipped with iron. Recessed for poles and eyes for laniards. Tip of one broken. Length, $4\frac{1}{8}$, $4\frac{3}{4}$, $5\frac{1}{8}$ inches. Eskimos, Cumberland Gulf. 29974. W. A. Mintzer, U. S. N.

HARPOON-HEAD OF BONE AND IRON.

Recessed for pole, rigid eye for laniard. Length, $5\frac{1}{2}$ inches. Eskimos, Cumberland Gulf. 29975. W. A. Mintzer, U. S. N.

SEAL-HARPOON HEAD.

Walrus-ivory, tipped with brass. New. Laniard, raw-hide. Bight seized with seal-sinew. Length of head, 3 inches; length of laniard, 59 inches. Eskimo, Cape Lisburne, Arctic Ocean. 46032. W. H. Dall.

SEAL-HARPOON HEAD.

Ivory, tipped with brass. Laniard, raw-hide, seized with seal-sinews. Length of head, $3\frac{1}{8}$ inches; length of laniard, 15 inches. Eskimo, Cape Lisburne, Alaska. 46033. W. H. Dall.

SEAL-HARPOON HEAD.

Walrus-ivory, tipped with iron. Laniard, raw-hide. Bights seized with seal-sinew. Length of head, 3 inches; length of laniard, 51 inches. Eskimo, Cape Lisburne, Alaska. 46035. W. H. Dall.

SEAL-HARPOON HEAD.

Walrus-ivory, with brass tip. Laniard, raw-hide. Seized with sinew of seal. Length of head, $3\frac{7}{8}$ inches; length of laniard, $16\frac{3}{4}$ inches. Eskimo, Cape Lisburne, Alaska. 46038. W. H. Dall.

HARPOON-HEAD.

A detachable harpoon-head made of bone and iron. Length, $5\frac{7}{8}$ inches. Eskimo, Big Diomede Island. 46373. T. H. Bean.

HARPOON-HEAD.

Detachable head, bone, with iron tip. Rear part of head bifurcated. Strap, raw-hide. Wooden neck or shank inserted in recess of head and fastened to strap with a small raw-hide becket. Length, $5\frac{1}{2}$ inches. Nunivak, Alaska. 48240. E. W. Nelson.

HARPOON-HEAD.

Detachable head, tipped with iron. Rear end bifurcated. Raw-hide strap. Length of head, $5\frac{1}{2}$ inches. Nunivak, Alaska. 48241. E. W. Nelson.

SEAL-HARPOON HEAD.

Walrus-ivory, tipped with brass. Laniard, seal-hide. Length of head, 3 inches; Length of laniard, 8 feet 8 inches. Eskimo, Cape Lisburne, Alaska. 49034. W. H. Dall.

HARPOON-HEAD.

A detachable harpoon-head, bone, tipped with brass. Length, 9 inches. Ooglaamie, 1882. 56601. Lieutenant P. H. Ray, U. S. A.

HARPOON-HEAD.

A detachable harpoon-head, bone, with brass tip. Used by natives in capturing the whale. Length, $10\frac{1}{2}$ inches. Ooglaamie, 1882. 56602. Lieutenant P. H. Ray, U. S. A.

HARPOON-HEAD.

A detachable bone harpoon-head, tipped with brass; recessed for end of pole; eye for strap. Strap, raw-hide. Length of head, $4\frac{3}{4}$ inches; length of strap, 12 inches. Ooglaamie, 1882. 56623. Lieutenant P. H. Ray, U. S. A.

HARPOON-HEAD.

Bone, tipped with iron. Used in beluga fishing with the accompanying harpoon-shafts (72392–93). Length, 9¼ inches. Alaska. 72394. C. L. McKay.

BONE HARPOON-HEAD.

Length, 7½ inches. Alaska. 72395. C. L. McKay.

ESKIMO LANCES—SEAL AND WALRUS.

SEAL-LANCE.

Pole, wood; lance-head, flint, lashed to pole and served with seal sinew; grip, ivory. Length, 10 feet 2 inches. Norton Sound. 33889. E. W. Nelson.

SEAL-LANCE.

Pole, wood, served at tip with strips of baleen; shank, ivory, seized with thong of seal-skin; lance-head, iron, riveted to shank. Length, 12 feet 2 inches. Poonook, Alaska. 15954. H. W. Elliott. Used by natives for the capture of seal and walrus.

ESKIMO LANCE.

Pole, wood, butt-piece seized to pole with seal sinew; grip, ivory; lance-blade, section of walrus tusk, twenty inches long, seized to pole and served with seal sinew. Length, 8 feet 3 inches. Alaska. 36062. E. W. Nelson. Used by natives to kill both seal and walrus.

ESKIMO LANCE.

Handle, wood, one and one-half inches in diameter; butt-piece, ivory, wedge-shaped, inserted in scarf in the butt of pole, and lashed and served with the sinew of the seal; ivory peg near tip of handle used as a finger-grip when manipulating the instrument; lance-blade, longitudinal section of walrus tusk, lashed to pole with seal-thong. Total length, 8 feet. Alaska. 36063. E. W. Nelson. Used by natives in the capture of seal and walrus.

ESKIMO LANCE.

Pole, wood, butt-piece, ivory, wedge shaped, inserted in scarf at butt of pole and served with seal sinew; grip, ivory; lance, walrus ivory, 18¾ inches long, lashed to pole and served with seal sinew. Length, 7 feet 6 inches. 43379. E. W. Nelson. Used by natives to kill both seal and walrus.

ESKIMO SEAL-LANCE.

Pole, wood; butt, ivory with wedge-shaped scarf for lance or spear; lance lashed to butt with seal-skin thong; finger-grip, ivory; tip of pole served with black and horn-colored baleen strips; head-piece and shank, walrus ivory; harpoon wanting. Length, 9 feet. Sledge Island, Alaska. 45416. E. W. Nelson. Harpoon and lance or spear combined.

SEAL-LANCE.

Pole, wood; lance-head, flint, lashed to pole and seized with seal-sinew. Length, 9 feet. Cape Nome, Alaska. 45419. E. W. Nelson.

SEAL-LANCE AND HARPOON.

Handle, wood; lance, walrus ivory, lashed to butt with seal-skin; butt and tip of pole served with strips of wood; head-piece, walrus ivory, recessed for harpoon shank, and lashed to pole with a thong of seal-skin; grip, ivory; harpoon wanting. Length, 12 feet. Eskimo, Cape Lisburne, Arctic Ocean. 46176. W. H. Dall. Lance and harpoon combined.

ESKIMO LANCE.

Pole, wood; butt-piece, ivory, wedge-shaped, seized and served with seal sinew; grip, ivory, lashed to pole with seal sinew; tip of pole served with seal sinew, recessed for lance; lance, bone, 22 inches long, lashed to pole with thongs of seal-skin. Length, 8 feet. Nunivak Island, Alaska. 48377. E. W. Nelson. Used by natives to kill both seal and walrus.

ESKIMO LANCE.

Pole, wood; butt-piece, ivory, served with seal sinew; rigid ivory grip; lance, piece of walrus tusk, seized to pole with seal sinew. Length, 7 feet 8 inches. Nunivak Island, Alaska. 48378. E. W. Nelson. Used by natives to kill both seal and walrus.

ESKIMO LANCE.

Pole, wood; butt-piece seized to pole with seal sinew; grip, ivory; lance-blade, section of walrus tusk, 19 inches long, seized to pole, and served with seal sinew. Length, 8 feet 3 inches. Alaska. 48380. E. W. Nelson. Made and used by natives to kill both seal and walrus.

WALRUS-LANCE.

Pole, wood; lance-head, flint, $4\frac{1}{8}$ inches by 5 inches, inserted in recessed tip, lashed and served with seal sinew; pole in two sections to fit case. Total length, 20 feet 4 inches. Point Barrow, 1882. 56765. Lieutenant P. H. Ray, U. S. A.

SEAL-LANCE.

A stout wooden handle, with walrus-ivory lance, hollowed on one side, and an ivory butt-piece. The lance is lashed to the handle with a seizing of gut, and further secured by a string from the inner side of tip. An ivory peg is fastened to the butt of the point or blade, by means of which the operator is assisted in steadying the lance when manipulating it. Length, 5 feet. Alaska. 72401. C. L. McKay.

BELUGA-LANCE BUTTS.

Two butts made of walrus ivory, wedge-shaped, so as to be conveniently driven into the end of the lance, and provided with shoulders, by means of which they are seized and lashed. Length, 3¾ inches. 72403. Length, 4 inches. 72402. Alaska. C. L. McKay.

ESKIMO SPEARS.

SEAL SPEAR.

Frobisher Bay. 10264. Captain C. F. Hall.

SEAL-SPEAR.

Four conjoined pieces; lance-point, bone, rigidly fastened into the recessed bulb-shaped end of shank; shank, walrus bone, chamfered at rear extremity and lashed to the handle with seal sinew; handle, wood; butt, recessed; small bone butt-piece inserted in recess and lashed with seal-skin; lance-strap, seal-skin. Length, 65 inches. King William Island. 10272. Captain C. F. Hall.

SEAL-SPEAR.

Pole, wood; bone spear or lance lashed to butt with a seal thong; ivory grip, carved in imitation of head of seal, lashed to central part of pole; tip of pole served with strips of baleen; head-piece, ivory, recessed for ivory shank, lashed to a pole with a seal thong; harpoon wanting. Length, 9 feet 5 inches. Sledge Island, Alaska. 45418. E. W. Nelson. Harpoon and lance or spear combined.

WALRUS-SPEAR.

Detachable head, bone, tipped with slate, lashed with rawhide to a light wooden handle. Total length, 24½ inches. Alaska. 72481. C. L. McKay.

HARPOONS AND FLOAT-LINES.

HARPOON-HEAD.

Bone, with walrus-hide float-line. Eskimos, Port Foulke, Greenland. 565. Dr. I. I. Hayes.

HARPOON AND LINE.

Iron harpoon-head, with float-line made from walrus skin. Eskimos, Smith Sound. 14255. Captain C. F. Hall.

HARPOON AND FLOAT-LINE.

Line, walrus hide; head, bone, tipped with brass, fastened to line by means of a small laniard and an ivory toggle. Used by natives in capturing the beluga. Length of line, 68 feet. Alaska. 72397. C. L. McKay.

Float-Lines and Floats.

HARPOON WITH BLADDER-FLOAT.

Pole, wood, painted black, striped with dull red; tip served with seal-sinew and recessed for harpoon-head. Harpoon, bone, two barbed notches, attached to line with seal thong. Line probably seal sinew, stopped to pole; float bladder of seal, old, lashed to pole with seal sinew; ivory plug, ornamented, inserted in neck of bladder to be used when the bladder is inflated; finger-rest, horn. Length, 14 feet. Kodiak, Alaska. 11362. Vincent Colyer.

HARPOON-HEAD AND FLOAT-LINE.

Detachable harpoon-head, bone, tipped with slate. Line for bending on buoy, raw-hide. Length of head, $4\frac{3}{4}$ inches. Ooglaamie, 1882. 56562. Lieutenant P. H. Ray, U. S. A.

HARPOON-HEAD AND FLOAT-LINE.

Head, walrus-ivory, iron tip riveted with native copper. Line, walrus hide; bight caught in rigid eye of harpoon and seized with strips of baleen. Length of head, $4\frac{3}{8}$ inches; length of line, 107 feet. Point Chaplin, Siberia. 49151. E. W. Nelson.

SEAL-SKIN BUOY.

Stuffed. Ornamented with ivory pendants and feathers. Flippers attached. North Greenland. 19515. G. Y. Nickerson.

FLOAT-LINE.

Line made of walrus hide. Used in capture of walrus and whales, for attaching buoys. Sledge Island, Alaska, 1880. 45403. E. W. Nelson.

FLOAT-LINE.

A line made of seal-skin, used by the natives when capturing the beluga, for bending on buoys. Cape Darby, Alaska. 48106. E. W. Nelson.

TWO SEAL-SKIN BUOYS.

Skin of a small seal turned inside out. The apertures of head and feet are tied up or hermetically fastened by means of small bone studs, with the exception of one of the fore-legs, which is used for inflation, the hole being stopped by a wooden plug. A grommet, through which the buoy-line is rove, is seized to the neck. 24 by 15 inches. 72399. 26 by 16 inches. 72400. Alaska. C. L. McKay.

SEAL DECOYS.

THREE-CLAWED SEAL-SCRATCHER.

Handle and prongs wood, tipped with the claws of a seal; claws seized tightly with seal sinew, and lashed to an ivory peg,

THREE-CLAWED SEAL-SCRATCHER—Continued.

rigidly fastened in the palm. Length, $10\frac{3}{4}$ inches. Ooglaamie, 1882. 56555. Used by natives by scratching upon the ice or snow to attract the attention of seals. Lieutenant P. H. Ray, U. S. A.

FOUR-CLAWED SEAL-SCRATCHER.

Handle and prongs wood, tipped with the claws of seal; claws served with seal sinew, and lashed to a rigid ivory peg in palm; becket of seal-skin rove through a hole in the handle and knotted. Length, $8\frac{7}{8}$ inches. Ooglaamie. 56557. Used by natives by scratching upon the ice or snow to attract seals. Lieutenant P. H. Ray, U. S. A.

REMOVING ICE AND SNOW WHEN SEAL HUNTING.

LARGE ICE-DIPPER.

Handle wood, partially painted brick-dust red; dipper made of bone, steamed and bent into almost a perfect circle ($3\frac{3}{8}$ inches by $3\frac{7}{8}$ inches at bottom, 1 inch deep), with a lip. The bottom is interlaced with seal-skin thongs, forming a strainer. The dipper is lashed to the pole with seal sinew. New. Length, 38 inches. Alaska. 36024. E. W. Nelson. Used by natives when seal hunting for removing loose ice from seal holes.

SMALL ICE-DIPPER.

Similar to 36024. Reticulated bottom, strips of baleen; handle wood, one-half inch in diameter. Old. Length, $21\frac{1}{2}$ inches. Diomede Island. 63605. E. W. Nelson.

ESKIMO ICE-BRUSH.

Handle, wood; flaring bone butt-piece, inserted in recessed handle and wrapped with strips of seal-skin. Brush consists of a narrow strip of baleen, horn colored, with fringe attached, and seized to the handle with seal-skin thongs. Length, 30 inches. King's Island, Alaska. 63606. E. W. Nelson. Used by natives for brushing away snow when seal hunting, and also for brushing snow and ice from their garments.

PROBING FOR SEALS.

SNOW-PROBE.

A slender rod of bone, with a large knob and a small ferule apparently of moose-horn; ferule fastened with a small ivory peg. Length, 33 inches. Northeastern coast. 10274. Captain C. F. Hall. Used by the Eskimos in probing the air-holes in ice and under the snow to detect the presence of seals.

THROWING THE HARPOON.

THROWING-STICK.

Wood, grooved on one side; shoulder of ivory, against which the butt of the harpoon-shaft rests, rigidly fastened at the rear end of the groove. Two ivory pegs are permanently fastened on one side, at the rear end, to strengthen the grip. Used by natives for hurling the harpoon in the capture of the beluga. Length, 18 inches. Alaska. 72398. C. L. McKay.

ICE-CREEPERS.

ICE-CREEPERS.

Walrus ivory, with laniards made of seal-skin. One pair. Length, 3½ inches. Eskimo, Plover Bay, Siberia. 46260. W. M. Noyes.

WATCHING FOR SEAL.

SEAL-HUNTER'S STOOL.

Wood, heart-shaped; triangular hole cut near the center, with chamfered edge on lower sides; three small wooden pegs inserted as legs. Size, 12¾ by 8 inches; height, 5⅜ inches. Anderson River, Arctic coast. 3978. R. Macfarlane. A roughly constructed but durable utensil, used by Eskimos to stand upon while watching for seals in winter.

LINE-HOLDERS.

ESKIMO LINE-HOLDER.

A wooden rack, painted white, used by natives when beluga-fishing for carrying the line, buoy, &c. When in use it is placed on the deck of the kyak in front of the hunter. Size, 43 by 14½ inches. Alaska. 72404. C. L. McKay.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

F.

CATALOGUE

OF THE

COLLECTIONS OF FISHES

EXHIBITED BY THE

UNITED STATES NATIONAL MUSEUM.

BY

TARLETON H. BEAN,

CURATOR OF THE DEPARTMENT OF FISHES IN THE
UNITED STATES NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.

INTRODUCTION.

The collection of fishes in alcohol includes about 450 species and is composed of the following elements: Fishes of Alaska, species found in the Gulf of Mexico and East Florida, the genera of fresh-water fishes of the United States and Alaska, and the salmonoids of North America, exclusive of Greenland.

It was originally intended to add to the above the fishes of the Pacific coast of the United States and those of New England; but, as the amount of labor involved in the preparation of an exhibit so extensive would have been too great for the time allowed, it was thought best to limit the work as indicated above, especially as the New England species and those of our west coast have already been extensively distributed to museums in Europe.

The species exhibited at this time constitute nearly one-third of the whole number known to exist in North America north of Mexico. They are almost exclusively littoral species or those occurring in moderate depths.

In selecting the representatives of the fresh-water genera, I have endeavored, whenever possible, to obtain the type species of the genus and one of the types of the species. When this could not be spared, I have taken individuals identified by Professor Jordan and afterward verified by myself by means of the original descriptions and those published by Jordan and Gilbert in Bulletin No. 16, U. S. National Museum, and elsewhere. It is hoped, therefore, that the names employed to designate species may be relied upon as properly belonging to them. In some cases I have treated as distinct species certain forms which are now included under one name by other writers; this course seemed to me to be justified by the material examined, and will, doubtless, stand or fall upon its merits.

As to the specific names used, they are supposed to be the oldest legitimate ones. In the interpretation of generic characters I cannot always agree with some of my contemporaries, and these differences of opinion are reflected in the names employed.

The principal common names of the species are given in some detail; it is impracticable to fix upon any one appellation which is everywhere applied to a species; indeed, names of widely different signification are attached to fishes in the various portions of their habitat.

It is attempted to state the geographical distribution of species as fully and clearly as our knowledge of the literature and the fishes will permit. In many instances the limits of a species are not definitely

determined, but this catalogue deals with established facts of distribution as far as these are known to the writer.

The maximum size of the species, its importance as food or bait, and its reproductive habits, are briefly touched upon.

By far the greater portion of the fishes in alcohol are duplicates, and may be exchanged for other species of the same class which are desired in the Museum; a few, owing to their rarity, or to the circumstance of their being typical of the species, should be returned after the close of the Exhibition; these are plainly marked (R) after the catalogue number of the species.

From these general remarks we may pass on to a brief survey of the several groups of fishes exhibited, beginning with

THE ALASKAN FISHES.

The whole number of species at present known from this Territory is 123. These are, almost without exception, littoral species and inhabitants of moderate depths; deep-sea exploration in Alaska has not yet been attempted. The only species that may be considered along with those of the deep water are the following: *Eumicrotremus spinosus*, *Triglops pingelii*, *Alepidosaurus æsculapius*, *Alepidosaurus borealis*, *Chimæra colliei*, the species of *Raia* (*binoculata* and *parmifera*), and *Squalus acanthias*.

In a Preliminary Catalogue of the Fishes of Alaskan and Adjacent Waters* I have recorded 116 species as occurring in Alaska. Five of these are not definitely known to exist now in the Territory; they are the following: *Pleuronectes franklinii*, *Murænoides dolichogaster*, *Salmo irideus*, *Acipenser medirostris*, and *Raia batis* Pall. *Pleuronectes franklinii* is, in my opinion, identical with *P. glacialis* Pall. *Murænoides dolichogaster* has not been found by any collector within the last twenty years. *Salmo irideus* seems to be identical with *S. gairdneri*.

The example of *Acipenser medirostris* referred to by me was from the Sacramento River; no sturgeon is yet reported from Alaska. *Raia batis* of Pallas (not of Linné) may be *R. parmifera* Bean.

The following species are to be added to the catalogue; they were collected mainly by Capt. Henry E. Nichols, U. S. N.:

Psettichthys melanostictus (Grd.).
Parophrys ischyurus Jor. & Gilb.
Xiphister mucosus (Grd.) Jordan.
Delolepis virgatus Bean.
Chirolophus polyactocephalus (Pall.).
Potamocottus gulosus (Grd.).
Sebastichthys nigrocinctus (Ayres) Jor. & Gilb.
Sebastichthys nebulosus (Ayres) Jor. & Gilb.
Micrometrus aggregatus Gibbons.

---

* Proc. U. S. Nat. Mus., iv, pp. 239–272, December 24, 1881.

Stenodus mackenzii Rich.
Coregonus sp. indet.
Somniosus microcephalus (Bl. Schn.) Gill.
Galeorhinus zyopterus Jor. & Gilb.

Triglops pingelii, which was prematurely recorded by me from off Point Bingham, Gulf of Alaska, has recently been obtained in Southeastern Alaska by Capt. Henry E. Nichols; his example, which is large, does not differ from our numerous Atlantic specimens.

Delolepis virgatus, the scaled genus of *Cryptacanthidæ*, is now known to extend southward to Washington Territory.

Chirolophus polyactocephalus has been taken by Mr. E. W. Nelson only.

Potamocottus gulosus (Grd.) (*Cottopsis gulosus* Girard) was obtained in a mountain lake near Mount Tongass, Southeastern Alaska, by Captain Nichols.

Stenodus mackenzii has long been expected from Alaska, but was only recently received from Mr. Nelson; it is abundant in the Yukon, and is the largest white-fish in the Territory.

The humpback white-fish of the Yukon resembles *Coregonus syrok* C. & V., but appears to be an undescribed species.

We have *Somniosus microcephalus* jaws now from Southeastern Alaska and from Saint Michael's.

About three-fifths of the Alaskan fishes are useful for food and bait, and more than one-half of the number are well adapted to the uses of man. At least 40 of the species are widely distributed, and about 50 others are found in great abundance, where they occur at all.

The flounders and flat-fishes (*Pleuronectidæ*) are represented around the whole coast, one species extending from Colville River throughout Alaska, and south to San Luis Obispo, California, being the most widely distributed flounder known to me. From Unalashka north the number of species is smaller than in the Gulf of Alaska and around the Aleutians. All the species are suitable for food, and most of them are excellent. The halibut is especially good, even plumper than its Atlantic congener, and reaches a weight of 300 pounds. It is exceedingly abundant wherever fur-seals and other fish-eating pinnipeds do not annihilate its young, living as far north as Saint Michael's. In the Gulf of Alaska it is everywhere plentiful, and is destined to become the source of an important industry. The single large *Pleuronectes* is *P. stellatus*, which is extremely abundant and important for food. The small *Pleuronectes glacialis*, which abounds from Saint Michael's northward, makes up in numbers what it lacks in size, and forms a valuable addition to the food supply of travelers by sea. The common *Lepidopsetta bilineata* exists in great numbers over a wide area; it is a food-fish of great excellence. *Limanda aspera* and *Hippoglossoides elassodon* are good, but, occurring at greater depths than the last, they have much less importance.

The cod-fishes (*Gadidæ*) are equally represented in Northern and Southern Alaska, those of the latter division excelling the others in size. The most important species, commercially, is the common cod (*Gadus morrhua*), which is exceedingly plentiful on certain banks in the Gulf of Alaska and in the vicinity of the islands of the Aleutian chain. This fish will some day be as valuable in the Pacific as it is now in the Atlantic; it must wait until the west coast rivals the east in population, and then its importance will be appreciated. The Alaskan pollock (*Pollachius chalcogrammus*) has no value as food, but is one of the best baits for the cod. The "wachna" (*Tilesia gracilis*), though comparatively small, seldom exceeding a foot in length, is a very useful fish in Northern Alaska, where it is caught by natives in immense numbers. The burbot (*Lota maculosa*), though reaching five feet in length, is not a food-fish of much consequence.

Of the sculpins (*Cottidæ*) about a dozen species are used for food. The scaled sculpins (*Hemilepidotus*) are especially good.

Seven species of *Sebastichthys* are now known to inhabit Alaskan waters, being confined, so far as we are informed, to the Gulf of Alaska. All of these are excellent for food, and they seem to be sufficiently common.

The "rock cods" (species of *Hexagrammus*) are quite as good as the *Sebastichthys*, and they are more widely spread. One species has been found as far north as Port Clarence, and either the same or a closely related form frequents the entire coast southward to Sitka. *Hexagrammus superciliosus* extends westward to Attu. In the Gulf of Alaska at least three species are extremely abundant and constitute an important part of the food supply. A marked peculiarity of *H. ordinatus*, which is very common at Unalashka, is its green flesh, from which it has derived the name "green fish;" the green color disappears in the process of cooking, and the flesh is excellent. The same fish is remarkable for its beautiful smoky brown ova. Another very important, and perhaps the most important, member of this family of *Chiridæ* is the "Atka fish," "Atka Mackerel," or "Yellow fish" (*Pleurogrammus monopterygius*), a species which is extremely plentiful off Atka and the Shumagin islands and elsewhere in Alaska. This species is a good substitute for the mackerel (*Scomber scombrus*), resembling it in taste after salting, as well as in size and movements. It can be taken in purse seines and treated in nearly all respects just like the common mackerel. As a bait for cod it has no superior at the Shumagins. A small market is beginning to develop in San Francisco for this estimable fish, and in the future it will achieve the commercial importance which it so richly deserves. The largest species of this family, *Ophiodon elongatus*, reaches a weight of 30 pounds, and is valued for food. In Alaskan waters *Anoplopoma fimbria* is said to possess good qualities, while in the markets of San Francisco the same fish is considered quite inferior.

Bathymaster signatus, a little-known species of the family of *Trachi-*

nidæ, is called "cusk" at the Shumagins, where it is highly esteemed as a bait for the cod.

The common species of lant (*Ammodytes personatus* Girard) is found abundantly throughout the Territory and is largely used as bait by native fishermen for catching cod, species of *Hexagrammus*, *Sebastichthys*, etc., in hook fishing. The movements of the cod are influenced to a considerable extent by the presence of this little fish, so that fishermen recognize a "lant" school among others.

The pike (*Esox lucius* L.), according to Mr. Dall, is common in all the lakes and ponds of Northern Alaska, but is not found in the rivers. The U. S. National Museum has recently obtained it from the island of Kodiak through Mr. W. J. Fisher. In Northern Alaska it is used principally for dog-food.

A small, but very important, fish belonging to the family of *Umbridæ* is *Dallia pectoralis*, the "black-fish" of Northern Alaska, a species literally swarming in the innumerable fresh-water lagoons. Professor Nordenskjöld found it at Port Clarence and Bannister, Turner and Nelson sent down many individuals from Saint Michael's.

The family *Microstomatidæ* is represented in Alaska by the smelts (*Osmerus dentex* and *spirinchus*), the surf smelts (*Hypomesus olidus* and *pretiosus*), the capelin (*Mallotus villosus*), and the eulachon (*Thaleichthys pacificus*). The smelts are found chiefly northward, no specimens being recorded from any part of the Gulf of Alaska. It may be that there is really only one *Osmerus* in Alaska, as the *spirinchus* type may be simply the spent condition of *dentex;* of this, however, we cannot now be certain. *Osmerus dentex* resembles our Atlantic *mordax* in general appearance and size; it is abundant and forms an important source of food both fresh and in the dried state. The capelin is everywhere plentiful and is a valuable food for cod; it is extensively eaten by salmon also. From the stomach of a single small cod caught on Portlock Bank I took upwards of 40 capelin. In sheltered coves near the mouth of Cook's Inlet salmon were observed in pursuit of the dense schools of capelin which swarmed in those waters. In Plover Bay, Siberia, and at Cape Lisburne we found young capelin abundant in the month of August. The species of *Hypomesus* appear to be not widely distributed in Alaska. *H. pretiosus* is the larger and southern one and, doubtless, the more important as a food-fish. *H. olidus* is little known in the Territory; unlike *pretiosus*, it spawns in fresh-water ponds; its size is small, and it has been obtained from only one collector, Mr. Turner. The eulachon frequents the Gulf of Alaska, ranging westward to Shelikoff strait. Salted eulachon are sent from Katmai to Kodiak, and they are said to possess excellent table qualities.

The white-fishes (*Coregonidæ*) are among the most important food-fishes in Alaska. Six species of *Coregonus* are found, one of which reaches Kodiak southwardly. In Northern Alaska the largest species exist; one of these is generally supposed to be identical with the common

white-fish of the Great Lake region, *C. clupeiformis*. In the Yukon this species is said to reach the weight of 30 pounds; it is, in all probability, the "broad white-fish" of Mr. Dall,* which, he says, "is usually very fat and excellent eating. It abounds in both winter and summer, spawning in September in the small rivers falling into the Yukon." The species for which Milner proposed the name *C. kennicottii* is similar to the last in most respects; it grows to a large size and is a valuable food-fish. There are two other white-fish whose size is comparatively small, but they are abundant and very important as food; these are *C. laurettæ* and *C. quadrilateralis*, the former being especially plentiful in Arctic Alaska, while the latter ranges farther to the south and east. These two are about equal in size, neither of them exceeding 16 inches in length and 4 inches in depth. In shape and proportions *C. laurettæ* resembles the common *C. artedi* of the Great Lake region. It is worthy of mention that the *C. quadrilateralis* of Alaska shows considerable differences from that which we know as *quadrilateralis* in New England and in the eastern portion of its habitat generally. The "humpback white-fish" is not identical with *C. syrok* C. & V., to which it bears a close resemblance. It is not valued as food for man, but is used for dogs. The smallest of the white-fish, and the least valuable, is the "Nulatoski ciga" of the Russians, a species closely allied to, if not identical with, *C. merkii* Günther. Mr. Dall speaks of it as "a small, thin, bony species common near Nulato, on the Yukon, and * * * rarely more than half a pound in weight. It is of little use as food and is principally abundant in summer." Capt. C. L. Hooper obtained numerous examples of this small species from Eskimo in Kotzebue Sound during the summer of 1880. In this region and farther to the northward Eskimo carry great numbers of these little fish on their voyages, notwithstanding their poor quality. By far the finest of all white-fish is the "Inconnu" (*Stenodus mackenzii* Rich.), which is known to reach 4 feet in length and 50 pounds in weight. Both Mr. Dall and Mr. Nelson have seen examples of this size. Mr. Dall has written concerning it as follows: "This enormous white-fish is the finest of its tribe both in size and flavor. It is found in the rivers most of the year, but is most plentifully obtained and is in its best condition about the months of June and July. * * * It is full of spawn from September to January, when it disappears."*

Another important species of the *Coregonidæ* is the grayling or blanket-fish (*Thymallus signifer* Rich.). This is the most beautiful of all the grayling, and is moderately valuable as a food-fish. Mr. Dall has mentioned it as the only fish in the Yukon territory which will take the hook. Mr. Nelson secured a number of very fine specimens of this grayling. It frequents the small, rapid rivers and is especially abundant in the spring.†

---

* Rep. Comm. Agric., 1870, p. 386.

† Dall, *op. cit.*, p. 387.

The greatest fish wealth of Alaska, so far as the shore fisheries are concerned, lies in the abundance of salmon of the genus *Oncorhynchus*, which is represented by five species—*chouicha*, *keta*, *kisutch*, *nerka*, and *gorbuscha*. The first three of these are the largest, the whole series being named in the order of their size. *O. chouicha* is the giant of the group, and is the most important commercially; it attains to its greatest size in the large rivers, which it ascends long distances in its spawning season. In Alaska it is known to extend as far north as Bering Strait, and it is especially abundant in Cook's Inlet and in the Yukon. Individuals weighing nearly 100 pounds are occasionally reported from these waters, and even in the Columbia. The finest product of this salmon is the salted bellies, which are prepared principally on the Kenai, Kassilov, and Yukon Rivers; the fame of this luxury once extended to the center of Government in Russia. The well-known "quinnat salmon" is the same species; its importance, as evidenced by the efforts of the United States Fish Commission and other commissions towards its propagation and distribution, is too well understood to require additional mention. The great bulk of the salted salmon exported from Alaska are the small "red fish," *O. nerka;* and this species is sought after simply on account of the beautiful color of the flesh and not for its intrinsic value, which is far below that of most of the other species. All the salmon extend northward to Bering Strait, but only one, *gorbuscha*, is reported as occurring north of the Arctic Circle; *gorbuscha* is said by trustworthy parties to reach the Colville River. In the early part of its run the flesh of this little "humpback" seems to me to be particularly good. Other members of the family of *Salmonidæ*, and very important ones, are the species of *Salmo* (*purpuratus* and *gairdneri*) and *Salvelinus malma*, two of which reach a large size in Alaska. The first two are not known to exist much to the northward of Unalashka, while *malma* is believed to extend to the Colville. *S. gairdneri* resembles the Atlantic salmon in size and shape, but its habits are different; it is found filled with mature eggs in June. I have not seen any very large examples of *S. purpuratus* from the Territory, but the species is extremely abundant and valuable for food. The red-spotted char, *S. malma*, is everywhere plentiful and is highly esteemed as a food-fish; it grows much larger in Northern Alaska than in California, and has some commercial value as an export in its sea-run condition under the name of "salmon trout." Natives of Alaska make water-proof clothing from the skins of this fish.

The total amount of salmon exported in 1880 from the fisheries on the Kenai, Kassilov, and Karluk Rivers is reported to have been 2,089 barrels, estimated to contain the products of 1,982,000 pounds of fish in the fresh state. The exports of 1882 are shown in a table prepared by Mr. Wm. J. Fisher, tidal observer for the United States Coast and Geodetic Survey at Kodiak. Mr. Fisher confirms what I have said elsewhere about the good qualities of the *gorbuscha* sal-

mon. He writes as follows "Here at Saint Paul and vicinity the run of Garbushe has been unprecedentedly large. This fish is not used by our fisheries for export, but the natives prefer this kind, both in the shape of ukali or salted, to the other kinds." Other items of interest in Mr. Fisher's letter* are well worth recording. He says: "The run of king salmon (chowichee) at Kassilov and Kenai—Kenai Peninsula, Cook's Inlet—has not been as large during the past season as in prior years, the fish having taken a new departure over to the rivers on the opposite side of the inlet, where the supply has been very plentiful. The run of 'Garbushe,' humpback salmon, has been larger than in any preceding year. At Karluk the run of red (*O. nerka*) and silver salmon (*O. kisutch*) has been very large. During the last season two canneries have been established in this district, one at the Kassilov River and the other at the Karluk, but neither of them has come up to its expectations this season."

The statement of the amount of salmon taken is here appended.

Statement regarding the catch of the salmon fisheries on Kodiak Island and in Cook's Inlet, Alaska Territory, during the year 1882.

Time during which fishery was in operation.	Names of companies engaged.	Vessels employed.				Men employed.			Red salmon.	
		Number.	Name.	Tons.	Number of crew.	White.	Native.	Chinese.	Barrels.	Cases of 48 lbs.
	FISHERIES AT KARLUK, KODIAK ISLAND.									
April 15-Oct. 5	Western Fur and Trading Company, San Francisco.	....	.....	.....	.....	6	12	....	2,150	.....
April 5-Oct. 15	Alaska Commercial Company, San Francisco.	1	Sch. Mary	15	3	3	8	....	900	.....
April 5-Oct. 15	Smith, Hirsh & Co., San Francisco.	1	Sch. Calistoga	30	4	10	22	25	1,500	4,800
	FISHERY AT KENAI, COOK'S INLET.									
June-Sept	Alaska Commercial Company, San Francisco.	....	.....	.....	.....	1	6	1	.....	.....
	CANNERY AT KASSILOV RIVER, COOK'S INLET.									
May-Sept.....	Cutting & Co., San Francisco.....	1	Bk. Courier...	600	10	21	....	59	.....	.....

* To Prof. S. F. Baird, October 27, 1882.

Statement regarding the catch of the salmon fisheries on Kodiak Island and in Cook's Inlet, Alaska Territory, during the year 1882—Continued.

Time during which fishery was in operation.	Names of companies engaged.	King salmon.		Disposition of catch.	Remarks.
		Barrels.	Cases of 48 lbs.		
	FISHERIES AT KARLUK, KODIAK ISLAND.				
April 15–Oct. 5	Western Fur and Trading Company, San Francisco.	.....	.....	Shipped to San Francisco.	35,000 pounds dried fish, for use of native hunting parties.
April 5–Oct. 15	Alaska Commercial Company, San Francisco.	.....	.....	....do	15,000 pounds dried fish, for use of native hunting parties.
April 5–Oct. 15	Smith, Hirsh & Co., San Francisco.			do	
	FISHERY AT KENAI, COOK'S INLET.				
June–Sept	Alaska Commercial Company, San Francisco.	250	.....	Shipped to San Francisco.	
	CANNERY AT KASSILOV RIVER, COOK'S INLET.				
May–Sept.....	Cutting & Co., San Francisco.	.....	6,000	Shipped to San Francisco.	

SAINT PAUL, KODIAK ISLAND, ALASKA,
October 28, 1882.

The herring of Alaska, *Clupea mirabilis* Girard, resembles *C. harengus* pretty closely in most respects. It is just as abundant in the waters of that Territory as *harengus* is in the Atlantic, and it has the same good qualities; widely distributed and excessively abundant, invaluable both for bait and for food, it must be considered as one of the most important species in Alaska. No finer herring exist than those that may be seined at Iliuliuk, and sometimes near Saint Paul, Kodiak, or in Prince Frederick Sound. They are as plentiful as menhaden were in the early days of that fishery in Peconic Bay, Long Island; vessels have sailed for hours through their immense schools; acres of grass are sometimes covered with eggs deposited by the fish, which are carried beyond the usual tide-level by an extraordinary flood and then left on the land by the receding waters. An accident of this kind occurred early in July, 1880, under my own observation, on a sand-spit in Chugachik Bay, Cook's Inlet. *Clupea mirabilis* has been found as far north as Port Clarence; it is, however, most abundant in the Gulf of Alaska. In 1880 the Western Fur and Trading Company sent down to San Francisco five hundred boxes of smoked herring, 6 quarter-barrels, and 18 full barrels of salt herring, by way of experiment. A very important industry may be established with this species when a sufficient demand arises for its products.

The family *Catostomidæ* is represented by the common long-nosed sucker, *Catostomus longirostrum* Le Sueur, which cannot be called an

important food-fish even in Alaska, although the heads and roes are used in making soup. "This fish is abundant in the Yukon and other large rivers in Northern Alaska. It is of moderately large size, reaching five pounds in weight. * * * These fish are filled with spawn in April, a period when other fish appear to be out of season."* Recently Mr. William J. Fisher has sent us this sucker from the island of Kodiak, where its existence was previously unknown to ichthyologists.

The lamprey known from the Yukon, *Ammocœtes aureus* Bean, is extremely abundant and is eaten by the natives.

From the foregoing account it will be seen that Alaska is well supplied with food-fishes. All parts of the coast have an abundance of edible species. Even where the number of species is small the number of individuals is extremely large. Every male native of the proper age devotes a portion of his time to fishing, and employs the best apparatus and expedients in his possession for the capture and preservation of fish, because his existence depends in a great measure upon this source of food. Women and children aid the men by carrying, or half floating in, salmon and other species caught in the seines. They may be seen wading along near the water's edge, pulling vigorously at the great strings of fish which are to be cleaned and otherwise prepared for drying at the villages. According to a preliminary report made by Ivan Petroff, for the Tenth Census, there are about 30,000 inhabitants in Alaska. More than one-sixth of these are adult males, and are to be considered as fishermen. Considering the great abundance of fish everywhere, and the wasteful habits of the people, who learn nothing profitable from experience, no matter how bitter, we will be prepared to form an adequate idea of the vast quantities taken in the Territory. No fewer than 28,000 people depend largely upon fish for their subsistence, eating them fresh during their season, and in the form of *ukali* for the rest of the year. We have no records which give the actual number caught, aud must depend upon estimates made by persons who are familiar with the natives and their supplies. Mr. William J. Fisher, of Kodiak, has investigated this matter very carefully, and has received much information from parties who are engaged in preparing *ukali* (dried fish) for the winter supply of the natives. According to Mr. Fisher's estimate, each person will consume at least 750 fish annually, whose united weight will be certainly not less than 3,750 pounds in the fresh state. At this rate 28,000 people will consume 105,000,000 pounds of fish, the first cost of which is about one-half cent per pound, and their total value about $525,000. In my opinion this is below rather than above the actual value of the yearly supply of food-fishes in Alaska.

THE AMERICAN SALMONOIDS.

In the series of salmonoids will be found 38 nominal species; it should be stated, however, that some of these are mentioned under separate

*Dall, in Rep. Comr. Agric. for 1870 (1871), p. 388.

names merely to give them a prominence which they would not secure if they were merged with the typical forms under which they would be considered in a systematic treatise. Such are the following:

Coregonus artedi subsp. *sisco.*
Salmo salar subsp. *sebago.*
Salmo spilurus subsp. *pleuriticus.*
Salmo purpuratus subsp. *virginalis.*
Salmo purpuratus subsp. *henshawi.*
Salvelinus namaycush subsp. *siscowet.*

The following species are not included in the collection:

Osmerus attenuatus.
Hypomesus olidus.
Argentina syrtensium.
Coregonus kennicottii.
Coregonus tullibee.
Salmo stomias.
Salvelinus naresii.
Salvelinus arcturus.
Salvelinus rossii.
Salvelinus nitidus.
Salvelinus stagnalis.

Osmerus attenuatus is not represented in the United States National Museum by a single authenticated example. There are two headless specimens from San Francisco, which have been identified with Lockington's species. Certain others from Washington Territory, which were labeled "*Osmerus attenuatus*," are certainly *Hypomesus pretiosus.* We have also two smelt from San Francisco, which are marked "*Osmerus elongatus* Ayres." It appears to me that *Osmerus attenuatus* Lockington is very doubtfully distinct from *Hypomesus pretiosus* (Girard), if not identical with that species. Again, it has not been proven that *O. elongatus* is identical with *H. pretiosus*, and I have reason to believe that if an *Osmerus* different from *thaleichthys* and *pretiosus* is found in the San Francisco markets, it will prove to be *elongatus* of Ayres, and Lockington's *attenuatus* will become a synonym of *elongatus.*

Hypomesus olidus is exhibited in the Alaskan series; it is not well represented in the collection, only one person having obtained a few examples.

Argentina syrtensium is known from the type specimen only, and this was ejected from a fish stomach.

Coregonus kennicottii is one of the large white-fishes of Alaska; it is closely related to *C. clupeiformis*, the common species of the Great Lake region, differing from this chiefly in having the head somewhat shorter, with shorter jaws, and in the greater number of scales. Mr. Dall states that it abounds in both winter and summer, spawning in September in the small rivers falling into the Yukon.*

* Rep. Comr. Agric., 1870 (1871), p. 386.

Coregonus tullibee is rare in this Museum; I can find only one example of it at present. It is said to be somewhat common in the waters of the Hudson Bay region. Although a handsome species, it is not equal to the lake herring (*C. artedi*) in flavor. Our specimen was sent here by Mr. E. G. Blackford, of New York, who wrote that the tullibee is found in lakes in the extreme north of Minnesota, and also in Manitoba. This was in December, 1877, since which time no examples have been received.

Salmo stomias is conjectured by Jordan and Gilbert to be a variety of *S. purpuratus*. It is said to extend from Kansas River to the Upper Missouri, and to reach a length of 24 inches.

Salvelinus naresii (Günther) has recently been referred by Jordan and Gilbert to *S. oquassa* (Girard). This action is based upon examination of the descriptions only, and we must not consider that the identity of the two is yet established.

The remaining four species of *Salvelinus* (*arcturus*, *rossii*, *nitidus*, and *stagnalis*) are known to us only from the published descriptions. They inhabit the extreme northeastern portions of North America and the adjacent Arctic regions.

FISHES OF THE GULF OF MEXICO AND EAST FLORIDA.

The whole number of species now recorded from this region is about 380, and nearly 300 of these are in the list published by Goode & Bean July 29, 1882,* of the fishes of the Gulf of Mexico. A catalogue of the fishes of East Florida, prepared by Mr. G. Brown Goode in 1879,† contains the names of 223 species, all but 80 of which are mentioned in the catalogue of fishes of the Gulf of Mexico.

One hundred and fifty-nine of the species recorded in these two lists are exhibited in the series prepared for the London Exhibition. An examination of the catalogues will show that about 90 families are represented. Of these families the following have a comparatively large number of species: *Diodontidæ*, *Tetrodontidæ*, *Balistidæ*, *Syngnathidæ*, *Soleidæ*, *Pleuronectidæ*, *Ophidiidæ*, *Blenniidæ*, *Gobiidæ*, *Triglidæ*, *Labridæ*, *Pomacentridæ*, *Chætodontidæ*, *Xiphiidæ*, *Scombridæ*, *Carangidæ*, *Sciænidæ*, *Sparidæ*, *Pristipomatidæ*, *Centrarchidæ*, *Serranidæ*, *Belonidæ*, *Cyprinodontidæ*, *Clupeidæ*, and *Munrænidæ*. The fishes of commercial importance are to be found in the families *Pleuronectidæ*, *Labridæ*, *Chætodontidæ*, *Xiphiidæ*, *Scombridæ*, *Carangidæ*, *Sciænidæ*, *Sparidæ*, *Pristipomatidæ*, *Centrarchidæ*, *Serranidæ*, and *Clupeidæ*, and even from this list one may subtract the first four without much diminishing the total.

---

* Proc. U. S. Nat. Mus., v, pp. 234–240.

† Proc. U. S. Nat. Mus., ii, pp. 108–121, September 19, 1879.

Among the species most important for food or bait are the following:

Paralichthys dentatus.
Lachnolæmus falcatus.
Scomberomorus maculatus.
regalis.
Caranx hippus.
Trachynotus carolinus.
ovatus.
goreënsis.
glaucus.
Seriola stearnsii.
lalandii.
falcata.
Stromateus alepidotus.
Cynoscion maculatum.
nothum.
Pogonias chromis.
Micropogon undulatus.
Liostomus xanthurus.
Sciæna punctata.
ocellata.
Menticirrus alburnus.
nebulosus.
littoralis.
Lagodon rhomboides.
Sparus pagrus.
Diplodus probatocephalus.
Pomadasys fulvomaculatus.
Rhomboplites aurorubens.
Lutjanus caxis.
stearnsii.
blackfordii.
Diabasis plumieri (=*formosus*) and other species of *Diabasis.*
Anisotremus virginicus.
Micropterus salmoides.
Lepomis (several species).
Chænobryttus gulosus.
Ambloplites rupestris.
Pomoxys sparoides.
Epinephelus drummond-hayi.
morio.
nigritus.
guasa.
Trisotropis falcatus.
stomias.
Serranus atrarius.
Diplectrum fasciculare.
Roccus saxatilis.
Centropomus undecimalis.
Chætodipterus faber.
Pomatomus saltatrix.
Elacate canada.
Lobotes surinamensis.
Mugil albula.
brasiliensis.
Elops saurus.
Clupea sapidissima.
Anguilla rostrata.

Those of the above which have great commercial importance are: *Scomberomorus maculatus*, *Trachynotus carolinus*, *Cynoscion maculatum*, *Micropogon undulatus*, *Sciæna ocellata*, *Lutjanus blackfordii*, the species of *Epinephelus*, *Trisotropis stomias*, and *T. faleatus*, *Roccus saxatilis*, *Centropomus undecimalis*, and *Pomatomus saltatrix.*

The fauna of the Gulf of Mexico has within the last year been increased by the addition of about 50 species which were previously unknown to science. The collections made by Mr. Silas Stearns at Pensacola and other points in Florida, and by Prof. D. S. Jordan at Galveston, New Orleans, and Pensacola, have stimulated the investigation of the fauna, with the result of bringing forward a great many new and interesting forms. These discoveries represent 22 distinct families, and simply indicate the unfinished condition of explorations in that region. Indeed, since the publication of the latest lists and descriptive papers, Mr. Silas Stearns has secured a number of undescribed

fishes at Pensacola, and has given us the material wherewith we are enabled to extend the range of many species. Some of the most interesting of the recent additions are the following: *Hippocampus zosteræ*, *H. stylifer*, *Siphostoma zatropis*, *Bœostoma brachiale*, *Etropus crossotus*, *Genypterus omostigma*, *Cremnobates marmoratus*, various species of Blennies, *Opisthognathus lonchurus*, *O. scaphiurus*, *Porichthys plectrodon*, *Ioglossus calliurus*, *Chromis enchrysurus*, *Gerres olisthostoma*, *Stenotomus caprinus*, *Tylosurus gladius*, *Cyprinodon mydrus*, *Fundulus ocellaris*, *F. xenicus*, *Conger caudicula*, *Sphagebranchus teres*, *Letharchus velifer*, and *Myrophis lumbricus*.

A comparison of the lists will show that the littoral fishes of the Gulf of Mexico, or at least that portion of it recently investigated, are largely the same as those which inhabit the east coast of the Southern United States. The large admixture of West Indian forms will also be apparent.

THE GENERA OF FRESH-WATER FISHES.

The series of fresh-water fishes embraces 173 species, representing nearly all the genera and subgenera at present recognized by the majority of ichthyologists in the United States. The forms not represented by specimens in alcohol are the following:

ETHEOSTOMATIDÆ.

Ioa.
Hypohomus (subgenus of *Hadropterus*).
Alvarius (subgenus of *Pœcilichthys*).

AMBLYOPSIDÆ.

Chologaster.

ESOCIDÆ.

Mascalongus (subgenus of *Esox*). A cast and a photograph are exhibited.

CYPRINODONTIDÆ.

Pœcilia.
Adinia (subgenus of *Fundulus*). Exhibited in the Gulf of Mexico series.

COREGONIDÆ.

Allosomus (subgenus of *Coregonus*).

CLUPEIDÆ.

Pomolobus (subgenus of *Clupea*). Exhibited in the Gulf of Mexico series.

CATOSTOMIDÆ.

Lipomyzon (subgenus of *Catostomus*).
Placopharynx.
Quassilabia.

CYPRINIDÆ.

Coliscus.
Tirodon.
Hemitremia.
Protoporus.
Agosia.
Leucosomus (subgenus of *Semotilus*).
Symmetrurus.
Trycherodon.
Meda.

SILURIDÆ.

Gronias.
Schilbeodes (subgenus of *Noturus*).
Lepidosteus (subgenus including *L. osseus*, which is represented by a cast).

As already stated, I have tried to present the type species of the genus and one of the typical specimens of the species whenever that could be done without risk to the Museum collection. The series exhibited includes all of the genera properly belonging to the fresh waters, with the exceptions above noted. There are certain gobies which enter fresh waters, but they have not the same claims of consideration in the exhibition series as *Gobiosoma*, for instance, and need only be enumerated. They are: *Gobiomorus* (= *Philypnus*) *dormitator*, *Eleotris gyrinus*, *Dormitator maculatus*, *Gobius lyricus*, and *Culius amblyopsis*. *C. amblyopsis* is shown in the Gulf of Mexico series.

Under each of the economic species will be found some remarks concerning its importance, but it may prove convenient to have a separate list of the food fishes of this series, and I have accordingly introduced it here. It will serve at least to show the great majority of the general which afford food species.

PARTIAL LIST OF ECONOMIC FRESH-WATER FISHES.

Pomoxys sparoides.
Archoplites interruptus.
Ambloplites rupestris.
Chænobryttus gulosus.
Lepomis auritus.
pallidus.
gibbosus.
Micropterus dolomiei.
Perca americana.
Stizostethium vitreum.
Roccus saxatilis.
chrysops.
americanus.
Esox americanus.
lucius.
Dallia pectoralis.
Osmerus mordax.
Thaleichthys pacificus.
Thymallus tricolor.
Coregonus williamsonii.
clupeiformis.
artedi.
Salmo salar.
Oncorhynchus kisutch.
Salvelinus fontinalis.
Clupea vernalis.

Clupea mediocris.
sapidissima.
Ictiobus bubalus.
Bubalichthys urus.
Carpiodes cyprinus.
Cycleptus elongatus.
Catostomus tahoensis.
commersonii.
Chasmistes liorus.
Minytrema melanops.
Moxostoma macrolepidotum.
duquesnii.
Ceratichthys biguttatus.
Semotilus corporalis.
Pogonichthys macrolepidotus.
Mylochilus caurinus.
Mylopharodon conocephalus.
Ptychochilus oregonensis.
Squalius atrarius.
gibbosus.
Cyprinus carpio.
Carassius auratus.
Leptops olivaris.
Amiurus catus.
Ictalurus punctatus.
Anguilla rostrata.
Acipenser rubicundus.

A glance at the list will show that a small number of families furnish nearly all our food-fishes. They are as follows: *Centrarchidæ*, *Percidæ*, *Labracidæ*, *Esocidæ*, *Umbridæ*, *Salmonidæ*, *Clupeidæ*, *Catostomidæ*, *Cyprinidæ*, *Siluridæ*, *Anguillidæ*, and *Acipenseridæ*. As would be expected, the *Labracidæ*, *Esocidæ*, *Salmonidæ*, and *Clupeidæ* have the greatest commercial value. A singular fact is the importance of a species belonging to the family *Umbridæ*, which otherwise includes only a few worthless little species, known as mud-minnows, or mud-fish, and the Austrian dog-fish. An interesting account of the qualities of the edible species in question is given by Professor Nordenskjöld in the Narrative of the Vega Expedition. Mr. E. W. Nelson also has prepared a paper on the "Blackfish" (*Dallia pectoralis*) in Northern Alaska, in which he sets forth its great value to the natives. This contribution will appear in the Fisheries Report now being printed by the United States Fish Commission.

It is remarkable that no cyprinoid fish has yet been recorded from Alaska; one would certainly expect to find *Platygobio*, *Ptychochilus*, *Acrochilus*, *Mylochilus*, and *Richardsonius*. We must bear in mind, however, that inland exploration has not been extensive in that Territory, and many large bodies of fresh water have never been properly investigated.

CATALOGUE OF FISHES IN ALCOHOL.

FISHES OF ALASKA.

GASTEROSTEIDÆ.

1. Gasterosteus cataphractus (Pall.) Tilesius. STICKLEBACK; SALMON-KILLER.

San Francisco and Puget Sound (Jordan & Gilbert); coast and islands of Alaska; Bering Island (Stejneger); Kamtchatka (Pallas).

27998. (5 spec.) Saint Paul Island, Alaska, August 6, 1880. Dr. T. H. Bean.

2. Gasterosteus microcephalus Girard. NAKED STICKLEBACK.

Tulare County, California (Cooper); San Pedro, Monterey Bay, and San Francisco, California (Jordan & Gilbert); Puget Sound (Jordan & Gilbert); Southern Alaska west to Unalashka.

At Sitka, Clark's Trout (*Salmo purpuratus*) was found feeding upon this species.

28016. (5 spec.) Saint Paul, Kodiak, July 13, 1880. Baker & Bean.

3. Gasterosteus pungitius (Linn.) subsp. **brachypoda** Bean.

Ten-spined Stickleback.—Northern North America on both sides; on the east coast coming as far South as Labrador; on the west coast to Unalashka, the Shumagins, and Kodiak.

23997. (4 spec.) Saint Michael's, Alaska, 1876. L. M. Turner.

PLEURONECTIDÆ.

4. Lepidopsetta bilineata (Ayres) Gill. FLAT-FISH; WOWCK (Kodiak).

Monterey Bay and San Francisco, California (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Alaska north at least to Saint Paul Island.

In Alaska this is an excellent food-fish and is very abundant, being speared in large numbers in shallow water near the shore on the rising tide, especially towards evening.

27942. Port Chatham, Cook's Inlet, July 6, 1880. Dr. T. H. Bean.

5. Limanda aspera (Pallas) Bean. ROUGH FLOUNDER.

Oceano orientali (Pall.); De Castries Bay (Steind. & Kner); Alaska north to Port Clarence; Eastern Siberia.

Very abundant throughout the Gulf of Alaska. A food fish of excellent flavor. At the Shumagins, late in July, females have the ovaries well developed.

27944. Sitka, Alaska, June 13, 1880. Dr. T. H. Bean.

6. Pleuronectes glacialis Pallas. ARCTIC FLOUNDER.

? *Pleuronectes cicatricosus* Pall., Zoog. Ross.-Asiat., iii., p. 424—"mari inter Camtschatcam et Americam."

River Obi (Pallas); Northern Alaska from Saint Michael's northward.

A small species, but abundant and extremely important to the coast Eskimo in their voyages.

27947. Kotzebue Sound, Alaska, September 2, 1880. Dr. T. H. Bean.

7. Pleuronectes stellatus Pallas. STELLATE FLOUNDER.

San Luis Obispo, Monterey, and San Francisco (Jordan & Gilbert); Columbia River and Puget Sound (Jor. & Gilb.); Coppermine River (Rich.); Anderson River (Baird); De Castries Bay (Steind.); Plover Bay (Bean).

The Anderson River specimen is still in the U. S. National Museum. This is perhaps the most widely distributed, in latitude, of all the flounders; it reaches a large size and has considerable economic importance.

28012. Yakutat Bay, Alaska, June 24, 1880. Dall & Bean.

8. Hippoglossoides elassodon Jor. & Gilb.

Puget Sound to Unalashka. Common northward.

This is a food-fish of some value; the same is true of nearly all the species of *Pleuronectidæ* in Alaska.

27939. Unalashka, Alaska, July 28, 1880. Dall & Bean.

9. Hippoglossus vulgaris Fleming. HALIBUT; KAMBALA; PALTOOSE.

Sea between Kamtchatka and America (Pallas); San Francisco to Puget Sound (Jordan & Gilbert); the whole coast of Alaska as far north as Saint Michael's.

Sold sparingly in San Francisco markets, where it is brought from Vancouver Island. Experimentally canned near Sitka in 1879 and smoked at Kodiak later. The halibut in Alaska reaches a weight of 250 pounds, and is one of the most important sources of fish-food for the natives.

27707. Port Althorp, Alaska, June 20, 1880. T. H. Bean.

GADIDÆ.

10. Pollachius chalcogrammus (Pall). Jor. & Gilb. POLLACK; WHITING; SILVER HAKE.

Monterey Bay, California (Jor. & Gilb.); Puget Sound; Gulf of Alaska; Unalashka; Okhotsk and Kamtchatka Seas (Pallas).

Very abundant around the Shumagin Islands, where it is one of the most important baits for cod.

27742. Popoff Island, Shumagins, July 19, 1880. E. P. Herendeen.

11. Boreogadus saida (Lepech.) Bean. POLAR COD.

Northern Alaska south to Saint Michael's; Eastern Siberia; Northern Atlantic.

A small species, but, because of its great abundance, a very important food-fish.

32432. Ooglaamie, Alaska. U. S. Signal Service.

12. Gadus morrhua Linné. COD; TRESKA (Russian); AH-MO-DOC (Kodiak).

Puget Sound northward and westward to the ice line in Bering Sea, and the Okhotsk; DeCastries Bay (Steind.).

The principal fishing grounds are at the Shumagins and in the Okhotsk. The species is widely distributed in Alaska, very abundant, and finds plenty of suitable food and spawning-grounds.

29125. Kaigan Strait, Alaska, September 1, 1881. Capt. H. E. Nichols.

13. Microgadus proximus (Girard) Gill. TOMCOD.

Monterey and San Francisco (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Gulf of Alaska.

A small species, sold in large numbers in San Francisco markets. Its distribution in Alaska is not fully known.

27982. Yakutat Bay, Alaska, June 24, 1880. Dr. T. H. Bean.

14. Tilesia gracilis (Tiles.) Swainson. WACHNA.

Cook's Inlet to Saint Michael's, in Alaska; Kamtchatka.

Excessively abundant in October and November, when they are caught through holes in the ice with a hook made of white walrus ivory. A very important source of food for the natives as well as their dogs.

9286. Saint Michael's, Alaska. H. M. Bannister.

15. Lota maculosa (Le Sueur) Rich. LOSH; NALIME (Russian); BURBOT.

New England; Great Lake Region; Pennsylvania; Ohio; Missouri; Montana; British America; Kodiak Island; and northern part of Alaska.

Little used as food except in Montana and in northern regions. Reaches its largest size in the Yukon River.

32458. Kodiak, Alaska. W. J. Fisher.

LYCODIDÆ.

16. Gymnelis viridis (Fabr.) Reinhardt.

Northern Atlantic and Pacific, on the east coast of North America, extending as far south as the Gulf of Saint Lawrence; on the west coast reaching the Shumagin Islands.

Young individuals, 104 millimeters in length, were found in Plover Bay, Siberia, September 14, 1880.

24001. Unalashka, Alaska. W. H. Dall.

17. Lycodes turnerii Bean. TURNER'S LYCODES.

Northern Alaska and Eastern Siberia. Known from Saint Michael's and Plover Bay.

Young examples, 34 millimeters long, were dredged in Plover Bay August 13, 1880; they show distinctly the cross bands characteristic of the adult.

27552. Plover Bay, East Siberia. Dall & Bean.

CRYPTACANTHIDÆ.

18. Delolepis virgatus Bean. SCALED WRYMOUTH.

Washington Territory to Southern Alaska.

This remarkable genus was discovered by Capt. Henry E. Nichols, U. S. N., during the summer of 1880. Judge J. G. Swan has recently forwarded the species from Port Townsend, Washington Territory, where it was obtained from the stomach of a seal.

29149. (R.) Head of Kingcombe Inlet, B. C., August 2, 1881. Capt. H. E. Nichols.

STICHÆIDÆ.

19. Stichæus punctatus (Fabr.) Reinhardt.

Arctic seas; on the east coast of North America extending south to Halifax; in Alaska, known to occur southward to Kodiak Island, where it is not uncommon.

24012. Saint Michael's, Alaska. H. M. Bannister.

20. Lumpenus anguillaris (Pallas.) Girard.

San Francisco to Bellingham Bay (Cooper); Bellingham Bay (Suckley); Puget Sound (Jordan & Gilbert); coast of Alaska at least as far north as Saint Michael's and westward along the Aleutians; Kamtchatka (Pallas); Eastern Siberia (Bean).

The young, apparently of this species, was taken at Belcher Point, Arctic Ocean, August 27, 1880, by Dall & Bean.

29802. Sitka, Alaska, September 13, 1881. Capt. H. E. Nichols.

21. Notogrammus rothrockii Bean.

Arctic Alaska and Eastern Siberia.

The species is known only from specimens not longer than 35 millimeters, which are probably young. It is sufficiently common in the regions where it was observed.

27573. Cape Lisburne, Arctic Ocean, August 21, 1880. Dr. T. H. Bean.

XIPHISTERIDÆ.

22. Murænoides ornatus (Girard) Gill.

Centronotus lætus Cope, Proc. Amer. Phil. Soc., XIII, 1873, p. 27.

Puget Sound to Alaska, known to be abundant around the Gulf of Alaska and the whole Aleutian chain; not yet recorded farther north than the Bristol Bay region.

27916. Iliuliuk, Unalashka, August 2, 1880. Dr. T. H. Bean.

23. Xiphister chirus Jordan & Gilbert.

Monterey Bay and Puget Sound (Jor. & Gilb.); Aleutian Islands.

Known from Alaska by only a few individuals which are more elongate than typical *X. chirus* and may eventually be considered as representing a distinct species.

23958. Adakh, Alaska. W. H. Dall.

24. Xiphister rupestris Jor. & Gilb.

Monterey Bay (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Vancouver Island to Southeastern Alaska. Not yet received here from farther north than Sitka.

32407. Alert Bay, Alaska, February, 1882. Dr. Wm. Jones.

25. Anoplarchus atropurpureus (Kittlitz) Gill.

Monterey Bay and Puget Sound (Jor. & Gilb.); Vancouver Island and Fraser's River (Günther); the coast and islands of Alaska north to Norton Sound.

29820. Atka Island, Alaska, June 11, 1879. L. M. Turner.

ANARRHICHADIDÆ.

26. Anarrhichas lepturus Bean.

Norton Sound, Alaska; the specimens obtained are all from Saint Michael's.

29910. (261) Saint Michael's, Alaska, May 23, 1881. E. W. Nelson.

TRACHINIDÆ.

27. Bathymaster signatus Cope. CUSK of the Shumagins; RONQUIL.

Washington Territory northward to Unalashka. Very abundant at the Shumagin Islands. Not used as food; a valuable bait for cod.

27924. Sitka, Alaska, June 7, 1880. Dr. T. H. Bean.

TRICHODONTIDÆ.

28. Trichodon stelleri Cuv. & Val. SAND-FISH.

Occasional at San Francisco; northward to Bering Sea; abundant in the Gulf of Alaska and the eastern Aleutians.

This species secrets itself in the sand for the capture of small crustaceans.

23933. Unalashka, Alaska. W. H. Dall.

LIPARIDIDÆ.

29. Liparis pulchellus Ayres.

Monterey to Puget Sound (Jordan & Gilbert); northward to Kodiak and Unalashka in Alaska.

This is one of the largest species of the genus.

30317. Saint Paul, Kodiak Island, Alaska. W. J. Fisher.

30. Liparis cyclopus Günther.

Monterey (?) to Puget Sound (Jordan & Gilbert); Esquimault Harbor (Günther); southeastern part of Bering Sea.

24046. Unalashka, Alaska. W. H. Dall.

31. Liparis gibbus Bean.

Unalashka to Eastern Siberia.

27545. Plover Bay, Eastern Siberia, August 13, 1880. Dr. T. H. Bean.

32. Liparis calliodon (Pallas) Günther.

Shumagin Islands; Aleutians; Eastern Siberia; Kamtchatka. (Pallas).

23966. (2 spec.) Adakh, Alaska. W. H. Dall.

CYCLOPTERIDÆ.

33. Eumicrotremus spinosus (Müller) Gill. SPINY LUMP-FISH.

Iceland (Faber); Spitzbergen (Kröyer); Greenland (specimen in U. S. National Museum); south to Massachusetts Bay (U. S. Fish Commission); Eastern Siberia (Dall and Bean); Unalashka (Bean); Vancouver Island (Günther, as *Cyclopterus orbis*).

27505. Iliuliuk, Unalashka, October, 1880. Dr. T. H. Bean.

AGONIDÆ.

34. Podothecus acipenserinus (Pallas) Gill. ALLIGATOR-FISH.

Washington Territory northward to Unalashka, not uncommon in Alaska.

The young individuals from Cape Lisburne doubtfully referred by me to this species (Proc. Nat. Mus., vol. iv, p. 248) are probably different.

32481. Kodiak, Alaska, 1882. W. J. Fisher.

35. Siphagonus barbatus Steind.

Gulf of Alaska and north to Port Clarence (Bering Strait); "Eismeer, zunächst der Behringsstrasse" (Steind.); Hakodadi and Nagasaki, Japan (Steind.).

Found to be rather common at Port Clarence in September, 1880.

28052. Port Mulgrave, Alaska, June 24, 1880. T. H. Bean.

COTTIDÆ.

36. Cottus polyacanthocephalus Pallas.

Puget Sound (Jordan & Gilbert); everywhere abundant throughout the Gulf of Alaska and the Aleutians. Not yet certainly made out from farther north than Unalashka.

This is the largest of all the species of *Cottus*, reaching fully 30 inches in length.

27643. (1 spec.) Iliuliuk, Unalashka, July 28, 1880. Dr. T. H. Bean.
27946. (2 spec.) Illiuliuk, Unalashka, October 6, 1880. Dall & Bean.

37. Cottus niger Bean. BLACK SCULPIN.

Kodiak Island; Shumagin Islands; Saint Paul Island; probably north to Saint Michael's.

Very large individuals were collected at Kodiak in 1880 by Dall & Bean, and others of great size have recently come in from Wm. J. Fisher, of the same island.

27952. Saint Paul Island, Alaska, August 6, 1880. Dr. T. H. Bean.

38. Cottus humilis Bean.

Northern Alaska, Saint Michael's to Kotzebue Sound and, probably, to Belcher Point.

At Saint Michael's this is used by the natives for food.

21521. Saint Michael's, Alaska, June 11, 1875. L. M. Turner.

39. Ceratocottus diceraus (Pallas) Gill.

Southern Alaska; Kamtchatka. (Pallas.)

32015. Fort Tongass, Alaska, July, 1882. Capt. H. E. Nichols.

40. Uranidea microstoma Lockington.

Known from Sitka, Kodiak, and Unalashka.

The typical specimen was sent from Kodiak by Wm. J. Fisher, and was incorrectly credited (in Proc. Nat. Mus. iv., p. 249) to Mr. Lockington.

28083. (2 spec.) Unalashka, Alaska, August 1, 1880. S. Bailey.

41. Gymnacanthus galeatus Bean.

Unalashka; Steamer Bay (Southeastern Alaska).

Capt. Henry E. Nichols, U. S. N., discovered this interesting species in Steamer Bay, thus considerably extending its range in Alaska.

28097. Unalashka, Alaska, July 30, 1880. Dr. T. H. Bean.

42. Artedius fenestralis Jordan & Gilbert.

Artedius notospilotus Bean, Proc. Nat. Mus. iv, p. 250 (not of Girard).

Puget Sound (Jor. & Gilb.); Shumagin Islands; Unalashka.

This is the northern representative of *A. notospilotus*, differing from it in having a lower spinous dorsal and in the greater extent of the scales on the back.

23934. Unalashka, Alaska. W. H. Dall.

43. Hemilepidotus trachurus (Pall.) Günther.

San Francisco and Puget Sound (Jor. & Gilb.), Gulf of Alaska, Unalashka.

This species is most abundant in the southern part of its range.

27901. Sitka, Alaska, 1880. L. A. Beardslee.

44. Hemilepidotus jordanii Bean.

Gulf of Alaska, Unalashka, and other Aleutian Islands, Eastern Siberia.

A food-fish of excellent quality. Abundant in the western part of the Gulf of Alaska and in Cook's Inlet.

27612. Popoff Island, Alaska, July 17, 1880. Dr. T. H. Bean.

45. Leptocottus armatus Girard.

Coast of California (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Gulf of Alaska.

The species is common as far west as Kodiak, whence Mr. William J. Fisher has sent a number of fine examples.

27968. Sitka, Alaska, May 31, 1880. Dr. T. H. Bean.

46. Oligocottus maculosus Girard.

Coast of California (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Vancouver Island; east coast of Gulf of Alaska, north to Cook's Inlet.

Alaskan examples show certain differences from the typical form which may require for them a separate subspecific name.

27514. (2 spec.) Sitka, Alaska, June 3, 1880. Dr. T. H. Bean.

47. Oligocottus globiceps Girard.

Monterey Bay and San Francisco (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Gulf of Alaska and Aleutian Islands.

23959. Adakh, Alaska. W. H. Dall.

48. Blepsias cirrhosus (Pallas) Günther.

San Francisco (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Gulf of Alaska; Aleutian Islands; Saint Paul Island.

Messrs. Dall & Bean found it to be very abundant at Port Mulgrave and Unalashka in 1880; only young individuals were obtained.

28051. Port Mulgrave, Alaska, June 24, 1880. Dr. T. H. Bean.

49. Blepsias bilobus Cuv. & Val.

Gulf of Alaska (Kodiak); Kamtchatka (Günther).

In the National Museum specimens are known only from Kodiak. The species seems to be rare.

28061. (R.) Saint Paul, Kodiak Island, Alaska. W. J. Fisher.

50. Nautichthys oculofasciatus Girard.

San Francisco (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Kodiak; Unalashka; and other Aleutians.

All the Alaskan examples received so far are young.

28941. Alaska. W. H. Dall.

SCORPÆNIDÆ.

51. Sebastichthys ciliatus (Tiles.)

Gulf of Alaska; Aleutians (Pallas, as *Perca variabilis*).

The species is known to us from Southeastern Alaska and the island of Kodiak.

32008. Mary Island, Alaska, July, 1882. Capt. H. E. Nichols.

CHIRIDÆ.

52. Hexagrammus asper Steller.

San Francisco and northward (Jor. & Gilb.); coast of Alaska north to Port Clarence.

The young of this species were obtained in Cook's Inlet in July, 1880, and at Port Clarence in September of the same year by Messrs. Dall & Bean.

27650. Unalashka, Alaska, July 31, 1880. Dr. T. H. Bean.

53. Hexagrammus ordinatus (Cope) Bean. GREEN-FISH; TORPOOG (Russian).

This is an excellent food-fish, called green-fish because the flesh is naturally green, though white and very palatable after cooking. Gravid females were seined at Unalashka July 28, 1880; the eggs are brown.

27649. Iliuliuk, Unalashka, July 31, 1880. Dr. T. H. Bean.

54. Hexagrammus decagrammus (Pall.) Jor. & Gilb.

Coast of California (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); off Mount Saint Elias (Pallas); Gulf of Alaska; Unalashka.

The species is abundant in Southeastern Alaska, and is an important article of food.

29134. Sitka, Alaska, September 13, 1881. Capt. H. E. Nichols.

55. Pleurogrammus monopterygius (Pallas) Gill. ATKA FISH; ATKA MACKEREL; STRIPED FISH; YELLOW FISH.

Western part of Gulf of Alaska; Aleutian Islands.

This species is common in great schools in deep water about the Shumagins, and is the finest known bait for cod; it is even more abundant off Atka; it can be taken in purse seines like the mackerel, which it resembles in shape and, after cooking, in taste. This fish is certain to become very important commercially.

27930. Iliuliuk Unalashka, October 7, 1880. Robert King

56. Anoplopoma fimbria (Pallas) Gill. BESHOWE; COAL FISH.

Coast of California (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Southeastern Alaska.

This species is common and little esteemed in San Francisco markets, but highly prized in the Puget Sound region; it grows to a length of more than two feet.

32003. Hassler Harbor, Alaska, August, 1882. Capt. H. E. Nichols.

AMMODYTIDÆ.

57. Ammodytes alascanus Cope.

Southeastern Alaska; Unalashka.

Specimens agreeing with Cope's description of the above species are infrequent among the numerous representatives of *Ammodytes* in the collections of the U. S. National Museum.

24034. Unalashka, Alaska. W. H. Dall.

58. Ammodytes personatus Girard. SAND LAUNCE; LANT.

Monterey Bay and Puget Sound (Jor. & Gilb.); entire coast of Alaska north to Point Belcher; Eastern Siberia.

This little fish plays a very important part in the cod fishery, because of its great abundance and the greediness with which cod feed upon it.

28024. (2 spec.) Port Clarence, Alaska, September 6, 1880. Dall & Bean.

UMBRIDÆ.

59. Dallia pectoralis Bean. BLACK FISH.

Northern Alaska in the vicinity of Bering Strait. Recorded from Port Clarence by Smitt as *Dallia delicatissima*.

This is a food-fish of small size, but great importance; it is greatly esteemed and exceedingly abundant.

6661. (c.) Saint Michael's, Alaska. H. M. Bannister.

SALMONIDÆ.

60. Osmerus dentex Steind. SMELT.

Alaska, in the vicinity of Bering Strait; De Castries Bay, Siberia (Steind.).

This is an important food-fish both in the fresh and the dried state.

21527. Saint Michael's, Alaska, February, 1877. L. M. Turner.

61. Mallotus villosus (Müller) Cuv. CAPELIN; SHE-GAKH (Kodiak).

Entire coast of Alaska, Aleutian Islands, and Kamtchatka (Pallas).

The species is very important in the cod fishery. It occurs in immense schools in the Gulf of Alaska. Fully forty capelin were taken from the stomach of a ten-pound cod off Kodiak, July 8, 1880. The young were abundant in Plover Bay (Siberia) and at Cape Lisburne (Alaska) in August, 1880.

32424. Ooglaamie, Alaska. U. S. Signal Service.

62. Hypomesus olidus (Pallas) Gill. POND SMELT.

Saint Michael's, Alaska; streams and lakes of Kamtchatka (Pallas); De Castries Bay (Kner, as *Osmerus oligodon*).

This species is said to spawn in fresh-water ponds.

23973. Saint Michael's, Alaska, May 20, 1877. L. M. Turner.

63. Hypomesus pretiosus (Girard) Gill. SURF SMELT.

Coast of California from San Francisco northward; Puget Sound (Jor. & Gilb.); Southeastern Alaska.

An account of its spawning habits and of Indian methods of capturing it is given by Mr. J. G. Swan in Proc. U. S. Nat. Mus., vol. iii, p. 43.

27995. Port Mulgrave, Alaska, June 24, 1880. Dr. T. H. Bean.

64. Thaleichthys pacificus (Rich.) Girard. EULACHON; CANDLE-FISH.

Columbia River and Puget Sound (Jor. & Gilb.; Vancouver Island (Günther); Gulf of Alaska west to Katmai, on Shelikoff Strait.

An important food-fish, both fresh and dried. The manufacture of oil from this species has become an industry of some importance. The oil is used as a substitute for butter, and attempts have been made to introduce it to take the place of cod-liver oil.

24111. Wrangel, Alaska. R. D. Crittenden.

65. Stenodus mackenzii Rich. INCONNU; NAYLIMA (Russian).

Mackenzie's River and its tributaries; Yukon River.

A food-fish of great excellence, growing to a large size, four feet in length, and reaching 50 pounds in weight. "It is full of spawn from September to January, when it disappears."—Dall.

29889 (255). Nulato, Alaska, March, 1881. E. W. Nelson.

66. Coregonus laurettæ Bean. ?MORSKOI CIGA (Russian).

Yukon River, and northward to Point Barrow, Alaska.

This species is not large, rarely exceeding three pounds in weight, but it is a very important source of food on the Yukon and northward.

27695. (R.) Point Barrow, Alaska, 1880. Capt. C. L. Hooper.

67. Coregonus merkii Günther. Subsp.

Yukon River; Hotham Inlet; Kolima and other Siberian rivers (Pallas, as *Salmo clupeoides* fide Günther).

A small species, rarely exceeding a half pound in weight; little used as food in Alaska.

27698. (2 spec.) Hotham Inlet, Alaska, 1880. Capt. C. L. Hooper.

68. Coregonus quadrilateralis Richardson. ROUND WHITEFISH. (?) KRUG (Russian).

Lakes of New England; Upper Great Lakes; Slave Lake; Kodiak; Yukon River; rivers of Arctic North America (Günther).

A species of wide distribution and variability; of rather small size, but excellent quality.

32469. Kodiak, Alaska. W. J. Fisher.

69. Salvelinus malma (Walb.) Jor. and Gilb. BROOK TROUT; DOLLY VARDEN; SALMON TROUT (sea-run condition); GOLETZ (Russian).

Northern California, west of the Cascade Range; Puget Sound (Jor. & Gilb.); throughout the Aleutian Islands and the mainland of Alaska north to Colville River; Eastern Siberia (Bean).

This species sometimes reaches a weight of 12 pounds, being more abundant and of the largest size in the northern part of its range. The typical "Dolly Varden" condition is best known in McCloud River, California. As "Salmon Trout" at Kodiak it is an important article of commerce in the salted state.

27599. Old Sitka, Alaska, June 2, 1880. Dr. T. H. Bean.

70. Salmo purpuratus Pallas. CLARK'S TROUT; SALMON TROUT.

Rocky Mountain and Cascade regions (Jor. & Gilb.); Monterey Bay, San Francisco, Columbia River (Jor. & Gilb.); Puget Sound (Jor. & Gilb.); Southern Alaska; Kodiak; Unalashka.

A variable species of wide range, reaching a weight of 20 pounds; quite abundant in lakes at Sitka.

27903. Sitka, Alaska, June 3, 1880. W. M. Noyes.

71. Salmo gairdneri Richardson. GAIRDNER'S TROUT; STEEL HEAD; AH-SHUT (Sitka).

Monterey Bay, Sacramento River, Columbia River (Jor. & Gilb.); Puget Sound; Southern Alaska (Sitka to Kodiak).

This trout is the famous Edgecumbe trout of Sitka; it reaches the weight of 20 pounds, and then resembles the Atlantic Salmon in shape. Gravid females were obtained by me in Sitka, June 9–10, 1880. I am unable to detect specific differences between this trout and the *Salmo irideus* of Gibbons.

32460. Kodiak, Alaska. W. J. Fisher.

72. Oncorhynchus chouicha (Walb.) Jor. & Gilb. QUINNAT SALMON; KING SALMON; CHOWICHEE; CHINNOOK SALMON.

West coast of the United States from Monterey Bay northward, ascending the Sacramento, Columbia, and other rivers in great numbers; northward to Bering Strait.

The largest of all the salmon, reaching a hundred pounds in weight. The principal fisheries for this species are in the Sacramento, Columbia, Kassilov, Kenai, and Yukon rivers. The salted bellies of Yukon Chowichee are in especial favor.

27680. (Mounted half skin.) Kassilov R., Alaska. W. J. Fisher.

73. Oncorhynchus keta (Walb.) Gill & Jor. HOI-KOH; DOG SALMON.

West coast of the United States from San Francisco northward; around the coast of the mainland of Alaska, north to Hotham Inlet.

The reproductive organs of this salmon were found well developed in Cook's Inlet and at Kodiak in July, 1880.

27688. Hotham Inlet, Alaska, 1880. Capt. C. L. Hooper.

74. Oncorhynchus nerka (Walb.) Gill & Jordan. RED-FISH; KRASNOI RIBA (Russian).

West coast of North America, from Columbia River northward, ascending far up the streams; in Alaska north at least to the Yukon.

On account of the beautiful color of its flesh this inferior and abundant little salmon is more important for export from Alaska than any other. Natives prepare a large portion of their ukali from this fish. The principal fisheries for it in Alaska are at Karluk, on the island of Kodiak.

32539. Kodiak, Alaska. W. J. Fisher.

75. Oncorhynchus kisutch (Walb.) Jor. & Gilb. SILVER SALMON; KEEZITCH (Russian).

West coast of North America from San Francisco northward; in Alaska north to Bering Strait.

The first silver salmon made their appearance at Sitka in 1880, early in June, and by the middle of the month they were comparatively abundant there. Early in October of the same year spent fish were seen in large numbers near Iliuliuk, Unalashka, in a shallow, rapid stream which falls into Nateekin Bay. Indians at Sitka catch many of the silver salmon by trolling with herring bait (*Clupea mirabilis* Girard).

27929. Iliuliuk, Unalashka, October 6, 1880. Dr. T. H. Bean.

76. Oncorhynchus gorbuscha (Walb.) Gill & Jordan. GORBUSCHA; LITTLE HUMPBACK SALMON; DOG SALMON.

West coast of North America, from the Sacramento northward; extending in Alaska to the Colville River; Eastern Siberia.

Before it begins to "dog" this is an excellent fish, more like a trout than a salmon in flavor. Late in July the species is scarcely fit to be eaten. In the Yukon the spawning season is a little later.

27744. Saint Paul, Kodiak, Alaska, July 11, 1880. Dr. T. H. Bean.

CLUPEIDÆ.

77. Clupea mirabilis Girard. HERRING.

The whole west coast of North America from San Diego northward; in Alaska found as far north as Port Clarence and said to occur at the mouth of Colville River; Kamtchatka (Pallas).

Everywhere abundant; destined to be important in the cod fishery; especially fine herrings are caught at Unalashka. Early in July, 1880, great quantities of stranded herring were found to have deposited their eggs on a spit in Cook's Inlet.

27717. Unalashka, Alaska, July 31, 1880. S. Bailey.
31976. Port Wrangel, Alaska, October, 1882. Capt. H. E. Nichols.

CATOSTOMIDÆ.

78. Catostomus longirostrum Le Sueur. LONG-NOSED SUCKER.

Great Lake region northwestward to the Yukon in Alaska; Kodiak.

This species is very abundant in the Yukon, and has recently been sent down from the island of Kodiak; it is too full of small bones to be an important food-fish.

32465. Kodiak, Alaska. W. J. Fisher.

CHIMÆRIDÆ.

79. Chimæra colliei Bennett. RAT-FISH; ELEPHANT-FISH.

Pacific coast of North America from Monterey to Southeastern Alaska.

The male has been known to cause a serious wound by means of its cephalic appendage.

24041. Alaska.

GALEORHINIDÆ.

80. Galeorhinus zyopterus Jor. & Gilb. OIL SHARK.

Coast of Southern California from San Francisco to Cerros Island (Jor. & Gilb.); Southeastern Alaska.

The oil shark is valued for the oil in its liver; the Chinese make a soup from the fin-rays of this species.

5593. Sitka, Alaska. F. Bischoff.

SPINACIDÆ.

81. Squalus acanthias Linn. SPINED DOG-FISH; PICKED DOG-FISH; DOG-FISH.

Atlantic and Pacific coasts of North America, very abundant in the Gulf of Alaska.

At present this dog-fish is simply a nuisance to fishermen in the Gulf of Alaska, its liver not being utilized as it is on the coast of New England.

29120. Red Bay, Alaska, August 14, 1881. Capt. H. E. Nichols.

AMERICAN SALMONOIDS.

ARGENTININÆ.

1. Mallotus villosus (Müller) Cuv. CAPELIN.

North Atlantic and Pacific; in the Pacific known as far south as Sitka, in the Atlantic said to reach Cape Cod.

The young are found abundantly in late summer northward.

21209. ♂ & ♀. Newfoundland, —— Harvey.

27564. Juv. Plover Bay, Siberia, August 12, 1880. Dr. T. H. Bean.

2. Thaleichthys pacificus (Rich.) Girard. EULACHON; CANDLE-FISH.

Columbia River and Puget Sound (Jordan and Gilbert); Vancouver Island (Günther); known from various localities in the Gulf of Alaska, extending to Katmai on the peninsula of Aliaska.

The eulachon ascends the rivers in immense schools in the spring. It is an excellent food fish, both fresh and salted, and is the source of an oil or fat which has some commercial importance and is much used by natives.

27297. Frazer's River, British Columbia, Jordan & Gilbert.

3. Osmerus mordax (Mitch.) Gill. SMELT.

Atlantic coast from Nova Scotia to Virginia, entering streams and becoming land-locked, especially in lakes of Maine and New Hampshire; reaches a large size in Lake Champlain.

14797. Eastport, Maine, U. S. Fish Commission.

4. Osmerus dentex Steindachner. NORTHERN SMELT.

Eastern Siberia and Northern Alaska, not yet observed south of Saint Michael's, representing, in the North Pacific, *O. eperlanus* and *O. mordax* of the Atlantic.

29937 (223). Saint Michael's, Alaska, August 20, 1880, E. W. Nelson.

5. Osmerus thaleichthys Ayres. EULACHON SMELT.

Coast of California from Monterey northward. Rather common in San Francisco market.

27019. Monterey, California, Jordan & Gilbert.

6. Hypomesus pretiosus (Grd.) Gill. SURF SMELT.

This species derives its name from its habit of spawning in the surf. Its known range is from San Francisco to Yakutat Bay, Alaska.

All the examples of *Osmerus attenuatus* Lockington, so called in the National Museum collection, appear to me to be *Hypomesus pretiosus*, and the description of *O. attenuatus* fits the surf smelt very well.

27276. Puget Sound, 1880, Jordan & Gilbert.

7. Hyphalonedrus chalybeius Goode.

Atlantic Ocean, in deep water, off the coast of Rhode Island and southward to about N. lat. 38° 30′; first observed in the summer of 1880.

29062. N. lat. 38° 31′, W. long. 73° 21′, 156 fathoms, October 18, 1881. U. S. Fish Commission.

COREGONINÆ.

8. Coregonus williamsonii Girard. ROCKY MOUNTAIN WHITE-FISH.

Coregonus couesii MILNER, Report U. S. Fish Comm. (1872–1873) 1874. p. 88.

"Clear streams and lakes from the Rocky Mountains to the Pacific; abundant in the Sierra Nevada." Recently received from Mill Creek, Oregon, whence it was sent by Col. I. R. Moores.

10608. Provo River, Utah. Dr. H. C. Yarrow.

9. Coregonus quadrilateralis Rich. SHAD WAITER; ROUND-FISH.

Lakes of New England; Upper Great Lakes; northwestward to Alaska; recently sent from Kodiak Island in the Gulf of Alaska.

23494. Mackinaw Straits. L. Kumlien.

10. Coregonus clupeiformis (Mitch.) Milner. COMMON WHITE-FISH.

Great Lakes; British America; Alaska, growing to a very large size in the Yukon.

The most important of all the species of white-fish, now reproduced artificially in great numbers.

10574. Juv. Sand Island, Lake Superior. J. W. Milner.
28569. Ad. Detroit River. Frank N. Clark.

11. Coregonus labradoricus Rich. LAKE WHITING.

Great Lake Region; lakes of the Adirondacks, of mountains of New England and northeastward, preferring clear, cold lakes.

16867. Lake Winnipiscogee, New Hampshire. W. W. Fletcher.

12. Coregonus hoyi (Gill) Jordan. LAKE MOON-EYE; CISCO (Lake Michigan); SMELT (Western New York).

Lake Michigan and Lake Ontario, in deep water; lakes of Western New York, where it sometimes dies mysteriously in great numbers.

32165. Skaneateles, New York. J. C. Willetts.

13. Coregonus merkii Günther, subsp. MERK'S WHITE-FISH; NULATOSKI CIGA (Russian).

Known from Yukon River and Hotham Inlet, Alaska.

A small species, thin and bony, of little use as food. It differs from typical *merkii* in several particulars.

27698. Hotham Inlet, Alaska, 1880. Capt. C. L. Hooper.

14. Coregonus artedi Le Sueur. LAKE HERRING; MICHIGAN HERRING.

Great Lakes and northeastward to Labrador, the eye becoming larger and certain other characters varying to the northeastward.

10258. Ecorse, Michigan. J. W. Milner.

15. Coregonus artedi var. **sisco** Jordan. CISCO.

Small lakes of Michigan, Wisconsin, and Indiana.
A form of the preceding modified by residence in small deep lakes.

21501. Geneva Lake, Wisconsin, June 13, 1878. A. E. Lytle.

16. Coregonus nigripinnis (Gill) Jor. BLUE-FIN; BLACK-FIN.

Lake Michigan, in deep water; deep lakes of Wisconsin, known from the vicinity of Madison, Wisconsin, whence it has been sent by Fish Commissioner Welsh.

10257. Grand Haven, Michigan. J. W. Milner.

17. Thymallus signifer Richardson. BLANKET-FISH; GRAYLING.

British America and Alaska, abundant northward.
The dorsal fin of males and females is much higher than in the next species.

32582. Nulato, Yukon R., Alaska. E. W. Nelson.

18. Thymallus tricolor Cope. MICHIGAN GRAYLING.

Thymallus montanus MILNER, Rept. U. S. Fish Comr. (1872–1873) 1874, p. 741.

Streams of the southern peninsula of Michigan, abundant in Ausable River; headwaters of the Missouri in Montana.
A game fish of great beauty.

11115. Ausable River, Michigan. J. W. Milner.

19. Stenodus mackenzii Rich. INCONNU.

Luciotrutta Mackenzii GÜNTHER, Cat. Fish. Brit. Mus, vi, 1866, p. 164.

Mackenzie's River and its tributaries; Yukon River, Alaska.
A food-fish of great value; the largest of the white-fishes.

10573. Nulato, Yukon River, Alaska, April 2, 1867. W. H. Dall.

SALMONINÆ.

20. Oncorhynchus chouicha (Walb.) Jor. & Gilb. QUINNAT SALMON; KING SALMON.

Salmo quinnat RICH., F. B.-A., iii, p. 219.
Oncorhynchus quinnat GÜNTHER, Cat. Fish. Brit. Mus., vi, 1866, p. 158.

Ascends the large rivers of California and northward to the Yukon in Alaska.

This is the largest and most important of all the salmon, reaching a weight of 100 pounds. It is the principal species of the canneries and of the artificial hatching establishments of the United States Fish Commission on the Pacific coast.

27357. Sacramento River, California, 1880. Jordan & Gilbert.

21. Oncorhynchus keta (Walb.) Gill & Jor. DOG SALMON; HOI-KO (Russian).

Pacific coast from San Francisco northward to Hotham Inlet, Alaska.

27689. Hotham Inlet, Alaska, 1880. Capt. C. L. Hooper.

22. Oncorhynchus nerka (Walb.) Gill & Jor. RED-FISH.

Pacific coast from Columbia River to the Yukon in Alaska; Bering Island (Stejneger).

Salted in immense numbers on the island of Kodiak and in Cook's Inlet. A very important source of food for the natives of Alaska, especially on Kodiak and in Cook's Inlet.

32566. ♂ Wallowa Lake, Oregon. Capt. Charles Bendire, U. S. A.
32569. ♀ Wallowa Lake, Oregon. Capt. Charles Bendire, U. S. A.
August 31, 1880.

23. Oncorhynchus kisutch (Walb.) Jor. & Gilb. SILVER SALMON; KEEZITCH (Russian).

San Francisco northward to the Yukon River; Bering Island (Stejneger).

27066. Puget Sound, 1880. Jordan & Gilbert.

24. Oncorhynchus gorbuscha (Walb.) Gill & Jor. LITTLE HUMPBACK SALMON; GORBUSCHA (Russian).

San Francisco to Puget Sound (Jordan & Gilbert); coast of Alaska north to Colville River; Eastern Siberia (Steindachner; Bean); Bering Island (Stejneger).

A small salmon of excellent flavor when it first comes from the sea.

29890. St. Michael's, Alaska. July 27, 1880. E. W. Nelson.

25. Salmo salar Linn. SALMON.

North Atlantic, ascending rivers in Northern Europe and America.

On the western Atlantic side extended, by the efforts of the United States Fish Commission, as far south as the Susquehanna River. The young of this, or the land-locked form next to be mentioned, have been found in abundance even in North Carolina, where the Commission introduced the species.

10295. Bucksport, Maine. C. G. Atkins.

26. Salmo salar supsb. **sebago** Girard. SEBAGO SALMON; LAND-LOCKED SALMON.

Saint Croix River and lakes of Maine. Extensively introduced into other lakes and into streams southward.

10543. Grand Lake, Maine. M. C. Edmonds.

27. Salmo gairdneri Rich. GAIRDNER'S TROUT; STEEL-HEAD; HARD-HEAD; SALMON TROUT; AH-SHUT; EDGECUMBE TROUT.

Sacramento River and northward at least to Kodiak, Alaska.

A very large species, reaching 20 pounds in weight. Gravid females were seen at Sitka in June. In my opinion this and the next species are identical, but, as I cannot now publish my reasons for this belief, I continue for the present to use both names.

32577 (220). Oregon, 1880. Capt. Charles Bendire, U. S. A.

28. Salmo irideus Gibbons. RAINBOW TROUT.

Streams west of the Sierra Nevada, from near the Mexican line (Rio San Luis Rey) to Oregon (Jordan & Gilbert).

Reared artificially in large numbers by the United States Fish Commission on the McCloud River in California, and thence distributed eastward and across the Pacific.

27356. Monterey, California. Jordan & Gilbert.
15491. McCloud River, California, L. Stone.
32518. (Thirty months old.) Artificially reared at Northville, Michigan. Frank N. Clark.
32519. Same age and history as the preceding.
32526. (Eighteen months old.) Same history as 32518 and 32519.
32527. (Eighteen months old.) Same history as the last.

29. Salmo spilurus Cope. RIO GRANDE TROUT.

Upper Rio Grande and Basin of Utah, frequenting mountain streams (Jordan & Gilbert).

16757. Brazos River, New Mexico. Dr. H. C. Yarrow.

30. Salmo pleuriticus Cope.

Rio Grande; Utah Basin.

According to Jordan & Gilbert this trout is a variety of the last-named species, differing in its smaller scales and darker coloration.

17070. Pogosa, Colorado. C. E. Aiken.
15806. Rio Grande, Colorado. Dr. J. T. Rothrock.

31. Salmo purpuratus Pallas. CLARK'S TROUT; COLUMBIA RIVER SALMON TROUT; YELLOWSTONE TROUT; ROCKY MOUNTAIN BROOK TROUT.

Common in the Rocky Mountain region and the Cascades; northward to Cook's Inlet and Unalashka, in Alaska.

27259. Puget Sound, 1880. Jordan & Gilbert.
27904. Sitka, Alaska, May, 1880. Dr. T. H. Bean.

32. Salmo virginalis (Girard). UTAH LAKE TROUT; BROOK TROUT; SPECKLED TROUT.

Utah Basin.

A nominal species, according to Jordan & Gilbert, now merged into *S. purpuratus*.

16000. Provo, Utah.

33. Salmo henshawi Gill & Jordan. "LAKE TAHOE TROUT; SILVER TROUT; BLACK TROUT."

Lake Tahoe, California; Pyramid Lake, Nevada; streams of the Sierra Nevada.

This trout is now considered by Jordan & Gilbert to be a variety of the last. It is common in San Francisco markets, where individuals weighing 15 pounds or more are frequently seen.

32550. California. U. S. Fish Commission.

34. Salvelinus namaycush (Walb.) Goode. MACKINAW TROUT; LAKE TROUT; TOGUE.

Great Lakes; lakes of Northern New York, New Hampshire, Maine, and northeastward.

The largest of the trout, reaching a length of 3 feet and a weight of 40 pounds; varying greatly in coloration.

32583. Michigan. Frank N. Clark.

35. Salvelinus namaycush, subsp. **siscowet** Agassiz. SISCOWET.

Lake Superior.

The *siscowet* differs from the *namaycush* in the greater width of its head and body, smaller size, and limited distribution.

23493. Straits of Mackinaw. L. Kumlien.

36. Salvelinus oquassa (Grd.) Gill & Jor. OQUASSA TROUT; BLUE-BACK TROUT.

Lakes in Western Maine.

According to a note recently published by Professor Jordan this species includes *Salmo naresii* Günther, and its range would thereby be extended to Arctic America.

20688. Oquassa Lake, Maine. E. G. Blackford.

37. Salvelinus malma (Walb.) Jor. & Gilb. DOLLY VARDEN TROUT; SALMON TROUT; MALMA; GOLETZ.

Northern California, west of the Cascade Range; northward to Colville River, in Alaska; abundant throughout the Aleutians; Bering Island (Stejneger); Plover Bay (Bean).

This trout reaches its largest size northward; it is extensively salted at Kodiak, where it is called salmon trout (in the sea-run condition).

27726. Unalashka, Alaska, July 28, 1880. Dr. T. H. Bean.

38. Salvelinus fontinalis (Mitch.) Gill & Jor. BROOK TROUT.

Rivers and lakes of British America and of the northern parts of the United States and Appalachian Range (Goode). Introduced westward and southward artificially.

A species closely resembling this has been received here from Greenland. In the sea-run condition this is *Salmo immaculatus* H. R. Storer and *S. canadensis* Hamilton Smith.

16626. Wood's Holl, Massachusetts, December 14, 1875. V. N. Edwards.
20991. Bushwick, Long Island. E. G. Blackford.
32591. ♂. New York market. E. G. Blackford.
32592. ♀. New York market. E. G. Blackford.
32533. (22 months old.) Artificially reared at Northville, Michigan, by Frank N. Clark.
32534. Same age and history as 32533.

FISHES OF THE GULF OF MEXICO AND EAST FLORIDA.

MALTHEIDÆ.

1. Malthe vespertilio (L.) Cuv. BAT-FISH.

The species is credited to Newfoundland, where its occurrence was probably accidental; it belongs to the region of the southern United States, especially those bordering on the Gulf of Mexico.

20485. Pensacola, Florida.

2. Malthe cubifrons Rich. SEA BAT.

Described from an example which was said to have been taken off the coast of Labrador, but not since recorded from that region. Not uncommon on the east coast of Florida.

16727. Saint Augustine, Florida, December 7, 1875. Dr. J. M. Laing, U. S. A.

DIODONTIDÆ.

3. Chilomycterus geometricus (L.) Kaup. SPINY BOX-FISH; RABBIT-FISH; SWELL TOAD.

East coast of the United States from Southern Massachusetts to Texas; West Indies.

Common about Galveston, Texas, according to Jordan and Gilbert.

21492. Pensacola, Florida. Silas Stearns.

4. Diodon liturosus Shaw. PORCUPINE-FISH.

Diodon novemmaculatus CUV., Mém. Mus. Hist. Nat., iv, 1818, p. 136.
Diodon maculatus GÜNTHER, Cat. Fish Brit. Mus., viii, 1870, p. 307.

Tropical seas; San Diego (Jor. & Gilb.).

6150. Garden Key, Florida.

TETRODONTIDÆ.

5. Tetrodon nephelus Goode and Bean. ROUGH SWELL-FISH; PUFFER; BLOWER; SWELL TOAD.

Gulf of Mexico, abundant; east coast of Florida (Indian River).

This is the southern representative of *Tetrodon turgidus*, from which it differs notably in having fewer and larger spines on the upper parts and in its larger dorsal fin.

9909. Key West, Florida. William Stimpson.

6. Tetrodon testudineus Linné. GLOBE-FISH.

West Indies; East Florida; Gulf of Mexico. Only occasionally found on the coast of the United States.

3268. Indian River, Florida. Gustavus Würdemann.

OSTRACIONTIDÆ.

7. Ostracion quadricorne Linné. CUCKOLD; COW-FISH.

Tropical Atlantic, northward on the east coast of the United States to South Carolina; not abundant in the Gulf of Mexico.

5775. Mississippi.

8. Ostracion triquetrum Linné

West Indies; Southern Florida.

Judging from the collection in the National Museum, this species is uncommon in the Gulf of Mexico.

5989. Garden Key, Florida. Whitehurst.

9. Ostracion trigonum Linné. TRUNK-FISH; BOX-FISH.

West Indies; Southern Florida; occasional on the east coast of the United States north to Vineyard Sound, Massachusetts.

Mr. V. N. Edwards has obtained the young at various times in the vicinity of Wood's Holl, Massachusetts.

6596. Tortugas, Florida. J. B. Holder.

BALISTIDÆ.

10. Monacanthus occidentalis Günther. FILE-FISH.

West Indies; Southern United States; not uncommon about the Florida Keys.

5906. Indian Key, Florida. Gustavus Würdemann.

11. Balistes capriscus Linné. EUROPEAN FILE-FISH; TURBOT (Bermuda); DUSKY FILE-FISH; TRIGGER-FISH; LEATHER-JACKET.

Mediterranean; Bermuda; east coast of North America from Nova Scotia (?) to the Gulf of Mexico, where it is common.

The species is represented in the Colonial Museum at Halifax by a specimen said to have been taken on the coast of Nova Scotia. It has occurred several times at Wood's Holl, Massachusetts, and at Newport, Rhode Island.

32624. Charlotte Harbor, Florida. Dr. J. A. Henshall.

HIPPOCAMPIDÆ.

12. Hippocampus zosteræ Jor. & Gilb. PIGMY SEA-HORSE.

West coast of Florida; common at Pensacola.

This interesting species, first discovered at Pensacola in March, 1882, by Professor Jordan, is remarkable for its small size and its few-rayed dorsal fin.

31920. ♂ and ♀. Pensacola, Florida, 1882. Silas Stearns.

SYNGNATHIDÆ.

13. Siphostoma affine (Gthr.) Jor. & Gilb.

East and west coasts of Florida, abundant at Pensacola; Texas (Jordan).

30827. ♂ and ♀. Pensacola, Florida. Jordan & Stearns.

14. Siphostoma floridæ Jor. & Gilb. FLORIDA PIPE-FISH.

East coast of the United States from North Carolina (Jordan & Gilbert) to Florida; Gulf of Mexico. Abundant in Pensacola Bay (Jordan & Gilbert).

30826. Pensacola, Florida. Jordan & Stearns.

SOLEIDÆ.

15. Aphoristia plagiusa (L.) Jor. & Gilb.

Atlantic and Gulf coasts of the United States, extending northward to Cape Hatteras.

30204. Pensacola, Florida. Silas Stearns.

16. Achirus brownii Günther. SOLE.

Gulf of Mexico.

This species replaces in the Gulf *A. lineatus* of the Northern United States; the differences between the two forms are constant, and appear to me to warrant the use of distinct names.

21496. Pensacola, Florida. Silas Stearns.

17. Etropus crossotus Jor. & Gilb.

South Atlantic coast of the United States, South Carolina to Florida; Gulf of Mexico; Mazatlan; Panama

Not uncommon in the Gulf of Mexico and on the east coast of Florida.

18054. Saint John's River, Florida. Prof. S. F. Baird.

PLEURONECTIDÆ.

18. Paralichthys dentatus (L.) Jor. & Gilb. COMMON FLOUNDER.

Gulf of Mexico; Atlantic coast of the United States from Massachusetts to Florida, everywhere abundant.

This is one of the largest of the inshore flounders, and, in the northern portion of its habitat, is a food-fish of considerable importance. Professor Jordan found it abundant in the markets of Galveston, New Orleans, and Pensacola in March, 1882.

31028. Galveston, Texas. Prof. D. S. Jordan.

19. Paralichthys squamilentus Jor. & Gilb. PALE FLOUNDER.

Pensacola Bay, Florida.

This species, recently made known from examples taken at Pensacola by Professor Jordan, is represented in the National Museum collection by a moderate number of small individuals secured at Pensacola mainly by Mr. Stearns.

32585. Pensacola, Florida. Silas Stearns.

20. Hemirhombus pætulus Bean.

West coast of Florida, known from the Red Snapper banks near Pensacola.

All but one of the examples of this species so far sent from Pensacola were taken from stomachs of the Red Snapper (*Lutjanus blackfordii*). The adult has the interorbital space much wider than in the young, and the upper pectoral rays more developed.

30689. Pensacola, Florida. Silas Stearns.

OPHIDIIDÆ.

21. Ophidium beanii Jor. & Gilb.

Ophidium graëllsi GOODE & BEAN, Proc. U. S. Nat. Mus., v, p. 235; JOR. & GILB., *op. cit.*, p. 301 (with description); not *Ophidium Graëllsi* Poey.

West Florida.

The species is known from a few individuals obtained at Pensacola, none of which reach 6 inches in length.

30791. Pensacola, Florida. Silas Stearns.

BLENNIIDÆ.

22. Blennius asterias Goode & Bean. STELLATE BLENNY.

Southern Florida.

The species has not recently been obtained, perhaps for the reason that collections have not been made in the region from which the types are recorded.

6596. (R.) Tortugas, Florida. J. B. Holder. (?)

23. Chasmodes boscianus (Lac.) C. & V. BOSC'S SHANNY.

East coast of the United States from New York to Florida, exceedingly rare northward, but abundant from Cape Hatteras southward; Gulf of Mexico.

5721. Fort Morgan, Alabama: Gustavus Würdemann.

24. Chasmodes saburræ Jor. & Gilb. SMALL-MOUTHED SHANNY; ROCK SHANNY.

Gulf of Mexico, known definitely only from Pensacola, where it was discovered in March, 1882, by Professor Jordan.

30824. Pensacola, Florida. Jordan & Stearns.

25. Isesthes ionthas Jor. & Gilb.

West Florida, known from specimens obtained in Pensacola Bay.

30856. Pensacola, Florida. Jordan & Stearns.

26. Cremnobates marmoratus Steind.

Saint Thomas (Steindachner); Florida Keys (Bean).

30467. South Florida. Silas Stearns.

OPISTHOGNATHIDÆ.

27. Opisthognathus maxillosus Poey.

Cuba; Garden Key, Florida.

The species is known to us only from specimens which have long been in the Museum.

5866. Garden Key, Florida.

28. Opisthognathus scaphiurus Goode & Bean.

Garden Key and Pensacola, Florida.

The type of this *Opisthognathus* was taken many years ago by Dr. Whitehurst. Mr. Stearns has recently rediscovered the species and thus determined with certainty something concerning its habitat.

31902. Pensacola, Florida. Silas Stearns.

BATRACHIDÆ.

29. Batrachus tau L. subsp. **beta** Gthr. OYSTER-FISH; TOAD-FISH; SARPO.

Gulf of Mexico.

This is the common form of toad-fish in shoal water, replacing the typical *B. tau* of more northern waters; it does not nearly equal *B. pardus* in size. The species is abundant at Pensacola.

30811. Pensacola, Florida. Jordan & Stearns.

30. Batrachus pardus Goode & Bean. SARPO; TOAD-FISH; DEEP-WATER TOAD-FISH.

West Florida.

The species, which differs decidedly from the preceding in size, coloration, flabbiness, and habitat, is occasionally sent from Pensacola by Mr. Stearns; no small examples are known.

29886. Pensacola, Florida. Silas Stearns.

31. Porichthys plectrodon Jor. & Gilb.

Gulf of Mexico; South Carolina.

The species was first described from Galveston, Texas, where it is not rare according to Jordan & Gilbert; it has recently been found at Charleston by Professor Gilbert, and still more recently at Pensacola by Mr. Silas Stearns.

30894. Galveston, Texas. Prof. D. S. Jordan.

URANOSCOPIDÆ.

32. Astroscopus y-graecum (C. & V.) Gill. STAR-GAZER.

West Indies; Atlantic coast of Southern United States; Gulf of Mexico.

This species is said to possess electric powers in life; it has recently been confounded, by Jordan & Gilbert, with *A. anoplus*, from which it differs widely in the size of its scales, form of the naked postocular area, and in coloration. These differences may readily be observed by any one who has adult specimens before him.

30851. Pensacola, Florida. Jordan & Stearns.

GOBIESOCIDÆ.

33. Gobiesox virgatulus Jor. & Gilb.

Gobiesox virgatulus JOR. & GILB., Proc. U. S. Nat. Mus., 1882 (August 15), p. 293.

Gobiesox nudus GÜNTHER; not *Cyclopterus nudus* Linné.

Gulf of Mexico, occasionally taken at Pensacola and known from several examples obtained at Biloxi.

32625. Biloxi, Mississippi.

GOBIIDÆ.

34. Gobiosoma boscii (Lac.) Jor. & Gilb.

Gobius alepidotus BL. & SCHN., Syst. Ichth., 1801, p. 547.

Gobiosoma molestum GIRARD, Proc. Acad. Nat. Sci. Phila., 1858, p. 169, and U. S. & Mex. Bound. Surv., Fishes, p. 27, pl. xii, fig. 14.

GÜNTHER, Cat. Fish. Brit. Mus., iii, 1861, p. 556.

If the synonymy here given be correct, the range of this little goby is from Buzzard's Bay, Massachusetts, to Texas. The species has been found in the Potomac River, and the Gulf form is said to have been taken at the falls of the Ohio River.

30768. Pensacola, Florida. Silas Stearns.

35. Gobius soporator C. & V.

Gobius catulus GIRARD, U. S. & Mex. Bound. Surv., Fishes, 1859, p. 26, pl. xii, figs. 9, 10.

Atlantic coast of the Southern United States; Gulf of Mexico; Caribbean Sea; West Indies; Mediterranean?

This species has been found in large numbers at Pensacola by Mr. Stearns. The close resemblance of *G. catulus* to *G. soporator* was pointed out by Dr. Günther in 1861 (Cat. Fish. Brit. Mus., iii, p. 549.)

30755. (2 spec.) Pensacola, Florida. Silas Stearns.

36. Gobius boleosoma Jor. & Gilb.

Gobius boleosoma JORDAN & GILBERT, Proc. U. S. Nat. Mus., v, p. 295 and Bull. 16, U. S. Nat. Mus., 1883, p. 946.

Known only from Pensacola, Florida, where it is not uncommon.

30860. (2 spec.) Pensacola, Florida. Jordan & Stearns.

37. Culius amblyopsis Cope.

Culius amblyopsis COPE, Trans. Amer. Phil. Soc. Phila., 1870, p. 473.

Atlantic coast of Southern United States; Gulf of Mexico; Surinam; West Indies.

One specimen has recently been taken at Charleston, South Carolina, by Mr. C. C. Leslie and another by Prof. C. H. Gilbert, in July or August, 1882.

32853. Pensacola, Florida. Silas Stearns.

38. Ioglossus calliurus Bean.

Ioglossus calliurus BEAN, in GOODE & BEAN, Proc. U. S. Nat, Mus. v, p. 236 (name only); also in JOR. & GILB., *op. cit.*, p. 297; and pp. 419–421 (full description).

This singular species is known from several specimens obtained in deep water off Pensacola by Mr. Silas Stearns and Prof. D. S. Jordan.

30867. Pensacola, Florida. Jordan & Stearns.

TRIGLIDÆ.

39. Prionotus tribulus C. & V. SEA-ROBIN.

Atlantic coast of the Southern United States; Gulf of Mexico.

The species is abundant southward; specimens of very large size (more than a foot long) have been received from Pensacola, Florida.

31053. Galveston, Texas. Prof. D. S. Jordan.

SCORPÆNIDÆ.

40. Scorpæna plumieri Bloch. RASCACIO; SEA TOAD.

West Indies; Bermuda (Jones); both coasts of Mexico (Jor. & Gilb.); Gulf of Mexico; Caribbean Sea.

Richardson records an example, which is said to belong to this species, as having been procured at Newfoundland by Mr. Audubon.

6777. Fort Jefferson, Florida.

SCARIDÆ.

41. Scarus squalidus Poey. *Vieja mugre.*

West Indies; Florida Keys.

The species has not recently been received from Florida.

5995. (R.) Garden Key, Florida.

LABRIDÆ.

42. Platyglossus caudalis (Poey) Gthr. DONCELLA.

Julis caudalis POEY, Mem. Hist. Nat. Cuba, ii, p. 213.

Platyglossus caudalis GÜNTHER, Cat. Fish. Brit. Mus., iv, 1862, p. 166; JORDAN & GILBERT, Proc. U. S. Nat. Mus. v, p. 286; also in Bull. 16 U. S. Nat. Mus., 1883, pp. 937–938.

Cuba; Surinam; Pensacola Bay.

31928. Pensacola, Florida. Silas Stearns.

43. Platyglossus radiatus (L.) Jor. & Gilb.

Sparus radiatus LINNÉ, Syst. Nat., ed. xii, 1766, p. 472.
Julis humeralis POEY, Mem. Hist. Nat. Cuba, ii, p. 212.
Platyglossus florealis JOR. & GILB., Proc. U. S. Nat. Mus., v. p. 287.

Atlantic coast of the Southern United States; Gulf of Mexico; Surinam.

5853. Fort Jefferson, Florida. Whitehurst.
30213. Pensacola, Florida. Silas Stearns.

44. Xyrichthys lineatus (Gmel.) Jor. & Gilb. RAZOR-FISH.

West Indies; west Florida; not common on our coasts.

31925. Pensacola, Florida. Silas Stearns.

45. Xyrichthys vermiculatus Poey.

West Indies; Florida Keys.

It may be that this form and the last are identical, but the rather small points of dissimilarity appear to be constant.

5815. (R.) Garden Key, Florida. Whitehurst.

POMACENTRIDÆ.

46. Pomacentrus leucostictus Müll. & Trosch.

West Indies; Gulf of Mexico.

The species is moderately abundant on the west coast of Florida.

6116. Fort Jefferson, Florida. Silas Stearns.

47. Chromis enchrysurus Jor. & Gilb.

Chromis enchrysurus JORDAN & GILBERT, Proc. U. S. Nat. Mus. v, p. 286, and Bull. 16 U. S. Nat. Mus., 1883, p. 940.

Pensacola Bay, Florida.

The greater portion of the specimens secured by Mr. Stearns and Professor Jordan were "spewed up" by *Lutjanus blackfordii*. The species is well represented in the National Museum collection.

30793. Pensacola, Florida. Silas Stearns.

POLYNEMIDÆ.

48. Polynemus octonemus Girard.

West Florida to Texas.

Mr. Stearns has obtained several examples of this fish at Pensacola, where its occurrence was only recently noticed.

22823. Pensacola, Florida. Silas Stearns.

ACANTHURIDÆ.

49. Acanthurus chirurgus Bl. & Schn. SURGEON-FISH; DOCTOR-FISH; BARBERO.

Bermudas; West Indies; occasional on the Atlantic coast of the southern United States.

3424. Garden Key, Florida.

CHÆTODONTIDÆ.

50. Chætodon capistratus Linné.

West Indies; Florida Keys.

Mr. J. Matthew Jones reports having collected this species in the Bermudas.

6624. Fort Jefferson, Florida.

51. Pomacanthus arcuatum (L.) Cuv.

Pomacanthus paru GÜNTHER, Cat. Fish. Brit. Mus., iii, 1861, p. 55.

West Indies; Garden Key, Florida.

3172. Garden Key, Florida. Whitehurst.

TRICHIURIDÆ.

52. Trichiurus lepturus Linné. SILVERY HAIR-TAIL; SCABBARD-FISH; SABRE-FISH; SILVER EEL.

Warm seas. On the east coast of the United States north to Cape Cod; on the Pacific coast of America north to Lower California.

20556. Jacksonville, Florida. P. McQuaid.

SCOMBRIDÆ.

53. Scomberomorus maculatus (Mitch.) Jor. & Gilb. SPANISH MACKEREL; BAY MACKEREL.

East coast of the United States from Cape Cod south to Florida; Gulf of Mexico.

The species is not abundant north of the New Jersey coast; it commands a much higher price in New York market than it does in the market of Washington.

32622. Charlotte Harbor, Manatee Co., Florida. Dr. J. A. Henshall.

54. Orcynus alliteratus (Raf.) Gill. LITTLE TUNNY; ALBICORE.

Atlantic Ocean; occasionally found on the New England coast.

Several specimens have been taken at Pensacola by Mr. Stearns.

30156. Pensacola, Florida. Silas Stearns.

CARANGIDÆ.

55. Vomer setipinnis (Mitch.) C. & V. HORSE-FISH.

Tropical America; not uncommon on the east coast of the United States even as far north as Cape Cod, Massachusetts, and said to have been taken on the coast of Maine.

30696. Pensacola, Florida. Silas Stearns.

56. Selene argentea (Lac.) Brevoort. SILVER MOON-FISH; LOOK DOWN; HORSEHEAD; JOROBADO (Cuba).

West Indies; Gulf of Mexico; Atlantic coast of the United States to as far north as Cape Cod, Massachusetts; on the Pacific coast north to Lower California.

If the transformations of this species are those believed in by some excellent ichthyologists we must extend its range northward to Halifax, Nova Scotia, where the *Argyreiosus vomer* stage has been obtained by Mr. J. Matthew Jones. I am not satisfied that *A. vomer* and *S. argentea* are different ages of the same fish.

30174. Pensacola, Florida. Silas Stearns.

57. Decapterus punctatus (Mitch.) Gill. DOTTED SCAD; ROBIN (Bermudas); CIGAR-FISH (Pensacola).

Bermudas; West Indies; Brazil; Gulf of Mexico; east coast of the United States north to Cape Cod, Massachusetts.

The species has been taken at Wood's Holl by the U. S. Fish Commission. It seems to be rare on our Atlantic coast, but is common at Pensacola, Florida.

30787. Pensacola, Florida. Silas Stearns.

58. Caranx chrysus (Mitch.). CREVALLÉ; YELLOW CREVALLÉ; COJINUA (Cuba); JACK, BUFFALO JACK (Bermudas).

Bermudas; West Indies; Brazil; Gulf of Mexico; Atlantic coast of the United States north to Cape Ann.

A single individual of this species was taken in a net off Gloucester, Massachusetts, Sept. 18, 1878. The fish is abundant, but has little commercial importance, at least, so far as the Northern States are concerned.

21257. Pensacola, Florida. Silas Stearns.

59. Caranx hippus (L.) Gill. CREVALLÉ; JACK-FISH; YELLOW MACKEREL; HORSE CREVALLÉ; JIGUAGUA (Cuba).

West Indies; Gulf of Mexico; Atlantic coast of the United States north to Cape Cod, and, occasionally, to Massachusetts Bay.

This species sometimes exceeds 25 pounds in weight; it is occasionally taken at Wood's Holl, where it is readily sold.

30154. Pensacola, Florida. Silas Stearns.

60. Chloroscombrus chrysurus (L.) Gill. CASABE (Cuba).

West Indies; Gulf of Mexico; Atlantic coast of the Southern United States; said to occur in the Pacific north to Lower California, also in India.

This is a beautiful species, but has no commercial importance.

30704. Pensacola, Florida. Silas Stearns.

3091. Garden Key, Florida. Whitehurst.

61. Trachynotus ovatus (L.) Gthr. SHORT POMPANO; PALORRIETA (Cuba).

West Indies; Gulf of Mexico; Atlantic coast of the United States north to Cape Cod.

Young individuals have several times been taken at Wood's Holl and also at Vineyard Haven, Massachusetts, in midsummer. This is a food-fish of great excellence.

32621. Lake Worth, Dade Co., Florida, Dr. J. A. Henshall.

62. Trachynotus carolinus (L.) Gill. COMMON POMPANO; CAVALLÉ; POMPYNOSE.

West Indies; Gulf of Mexico; Atlantic coast of the United States north to Cape Cod.

The young are usually abundant in midsummer at Wood's Holl, Massachusetts. This is one of the most highly esteemed of all our food-fishes, sometimes bringing one dollar per pound in New York market The species reaches a large size.

7167. Florida. Gustavus Würdemann.

22854. Pensacola, Florida. Silas Stearns.

63. Seriola carolinensis Holbrook. RUDDER-FISH.

Atlantic coast of the Southern United States; Gulf of Mexico.

This species reaches a length of 30 inches, or more. The young have dark bands, which are not present in the adult.

22902. Pensacola, Florida. Silas Stearns.

64. Oligoplites occidentalis (L.) Gill. YELLOW JACKET; YELLOW TAIL.

Both coasts of Central America (Jor. & Gilb.); Pacific ocean north to Lower California (Jor. & Gilb.); West Indies; Gulf of Mexico; Atlantic coast of the United States north to Cape Cod.

5962. Garden Key, Florida. Whitehurst & Baker.

65. Elagatis pinnulatus Poey. RUNNER.

West Indies; Southern Florida. This is, apparently, a rare species.

4609. Florida. Gustavus Würdemann.

CORYPHÆNIDÆ.

66. Coryphæna punctulata (C. & V.) Gthr. SMALL DOLPHIN.

Pelagic; common in the Gulf of Mexico and not rare on the Atlantic coast of the Southern United States. Until it is determined whether or not we have two dolphins on our east coast the above name may as well be used as any other.

30148. Pensacola, Florida. Silas Stearns.

STROMATEIDÆ.

67. Stromateus paru Linné. HARVEST FISH.

New Jersey to South America; abundant southward. This is a small but valued food-fish, which finds its way in moderate numbers even to Washington market.

12871. Fernandina, Florida. L. W. Ledyard.

NOMEIDÆ.

68. Nomeus gronovii (Gmel.) Gthr.

Tropical Atlantic, north to Florida.

This beautiful species is occasionally sent from Pensacola by Mr. Stearns. Young examples, about 25 millimeters in length, were obtained.

3425. Garden Key, Florida.

SCIÆNIDÆ

69. Pareques acuminatus (Schn.) Gill. CARRUB (Bermudas).

Bermudas; West Indies; Brazil; Gulf of Mexico.

This is a species of small size, and is not valued for food.

26575. Key West, Florida. Silas Stearns.

70. Cynoscion maculatum (Mitch.) Gill. SALMON-TROUT; SPOTTED SEA TROUT; SPECKLED TROUT.

Atlantic coast of the United States, from Virginia southward; Gulf of Mexico.

This species is everywhere considered a valuable food-fish; it reaches a weight of about ten pounds, thus rivaling *C. regalis* in size. In the Washington markets this fish is quite common; in the Gulf of Mexico it is very abundant.

30832. Pensacola, Florida. Jordan & Stearns.

71. Pogonias chromis (L.) Cuv. DRUM; TAMBORO

Atlantic coast of the United States, from Cape Cod to Florida; Gulf of Mexico; West Indies.

This is perhaps the largest fish of the family to which it belongs, sometimes reaching the weight of 50 pounds. Its flesh, however, is coarse and less valued than that of nearly all the other sciænoids. The species is abundant southward, and affords much sport to the angler.

18036. Matanzas River Inlet, Florida. J. C. Willetts.

72. Liostomus xanthurus Lac. SPOT; LAFAYETTE; GOODY, OLDWIFE; CHUB; ROACH; YELLOW-TAIL.

Atlantic coast of the United States, from Cape Cod to Florida; Gulf of Mexico.

The species is abundant from Virginia southward, and is everywhere valuable for food. It seldom exceeds a foot in length.

632. Santiago, Texas. Lieutenant D. N. Couch.
21478. Pensacola, Florida. Silas Stearns.

73. Stelliferus lanceolatus (Holbrook) Gill.

Atlantic coast of the United States from Virginia to Florida; Gulf of Mexico.

18038. Matanzas River Inlet, Florida. J. C. Willetts.

74. Sciæna chrysura (Lac.) Jor. & Gilb. SILVER PERCH; YELLOW-TAIL; MADEMOISELLE.

Bairdiella argyroleuca (Mitch.).

Bodianus argyroleucus MITCHILL, Trans. Lit. & Phil. Soc. N. Y., 1814, p. 417, pl. 6, fig. 3.

Atlantic coast of the United States from Cape Cod to Florida; Gulf of Mexico.

The species is abundant southward; its size is small, but the quality of the flesh is good.

31037. Galveston, Texas. Prof. D. S. Jordan.

75. Sciæna ocellata (L.) Gthr. CHANNEL BASS; RED-FISH; POISSON ROUGE; PEZ COLORADO; BASS; RED BASS; SEA-BASS; SPOTTED BASS.

Cape Cod to Florida; Gulf of Mexico.

This is a rival of the drum in size and is vastly more important as a food-fish. Professor Jordan records it as "the most important food-fish of the Texas coast, the amount taken exceeding that of all other species combined."

30845. Pensacola, Florida. Jordan & Stearns.

76. Menticirrus alburnus (L.) Gill. WHITING; CAROLINA WHITING; GROUND MULLET.

Atlantic coast of the United States from Cape Hatteras to Florida; Gulf of Mexico.

A food-fish of good quality; its size is rather small, the length averaging scarcely one foot. The closely allied *M. nebulosus* has been taken several times at Gloucester, Massachusetts, off Cape Ann.

31051. Galveston, Texas. Prof. D. S. Jordan.

77. Menticirrus littoralis (Holbr.) Gill. SHORE WHITING; SURF WHITING.

Atlantic coast of the United States from Cape Hatteras to Florida; Gulf of Mexico.

This is a common species southward, and it is a good food-fish.

18040. Matanzas River Inlet, Florida. J. C. Willetts.

78. Micropogon undulatus (L.) C. & V. CROAKER; RONCO; VERRUGATO (Cuba).

Atlantic coast of the United States from Cape Cod to Florida; Gulf of Mexico; West Indies.

This is a food-fish of small size but good quality; it is not uncommon in Washington market, where it comes from Norfolk, Virginia. In the Southern States it is abundant.

22906. Arlington, Florida. F. C. Goode.

GERRIDÆ.

79. Gerres homonymus (Goode & Bean) Jor. & Gilb.

Diapterus homonymus GOODE & BEAN. Proc. U. S. Nat. Mus., ii, p. 390.
Eucinostomus argenteus GIRARD, U. S. and Mex. Bound. Surv., 1859, Fish., p. 17, pl. ix, figs. 9–12 (not of B. & G.).

Gulf of Mexico.

The species is known from young specimens only.

26597. Cedar Keys, Florida. Silas Stearns.

80. Gerres olisthostoma Goode & Bean. IRISH POMPANO.

Gerres rhombeus POEY (part), Syn. Pisc. Cub., 1858, p. 32; not *Gerres rhombeus* C. & V., Hist. Nat. Poiss., v, p. 459.

Mr. Earll found the species sufficiently common and reaching a large size in Indian River.

25118. Indian River, Florida. R. E. Earll.

SPARIDÆ

81. Lagodon rhomboides (L.) Holbr. SAILOR'S CHOICE; PINFISH; BREAM; SARGO (Cuba); CHOPA SPINA.

Atlantic coast of the United States from Cape Cod to Florida; Gulf of Mexico; West Indies.

This fish has several times been obtained at Wood's Holl, Massachusetts; it is abundant southward, and, though comparatively small, is an important food-fish.

31052. Galveston, Texas. Prof. D. S. Jordan.

82. Diplodus probatocephalus (Walb.) Jor. & Gilb. SHEEPSHEAD.

Atlantic coast of the United States from New York to Florida (occasionally farther north); Gulf of Mexico.

This is one of the best known and most esteemed of our food-fishes; it reaches a weight of twelve pounds; it is a formidable enemy of the oyster.

18030. Matanzas River Inlet, Florida, J. C. Willetts.

83. Pagellus milnerii Goode & Bean.

West Florida.

The species is known from a few individuals only; it belongs to the genus *Calamus* Swainson. None of our examples reach a foot in length.

26565. Pensacola?, Florida. Silas Stearns.

PRISTIPOMATIDÆ.

84. Diabasis fremebundus (Goode & Bean) Jor. & Gilb.

South and west Florida.

The species is represented in the Museum by several young specimens; the adult form is unknown.

3093. Garden Key, Florida. Whitehurst.

85. Diabasis chrysopterus (L.) Jor. & Gilb. MARGATE-FISH.

Hæmulon chrysopterum HOLBROOK, Ichth. South Carolina, 1860, p. 121. pl. XVII, fig. 1.

Atlantic coast of the southern United States; Gulf of Mexico; Bermudas (Goode).

32170. Key West, Florida.

86. Diabasis plumieri (Lac.) Jor. & Gilb. RED-MOUTH GRUNT.

Hæmulon arcuatum HOLBROOK, Ichth. S. C., 1860, p. 124, pl. XVII, fig. 2.

Atlantic coast of the United States from South Carolina to Florida; Gulf of Mexico.

32601. Key West, Florida. Dr. J. A. Henshall.

87. Diabasis aurolineatus (C. & V.) Jor. & Gilb.

Said by Jordan & Gilbert to be the same as number 85 (*H. chrysopterum* Holbr.)

West Indies; Gulf of Mexico.

The species is not uncommon in deep water in Pensacola Bay; most of the examples forwarded by Mr. Stearns were ejected by "red snappers" (*Lutjanus blackfordii*).

30794. Pensacola, Florida. Silas Stearns.

88. Diabasis elegans (C. & V.) Jor. & Gilb.

West Indies; Gulf of Mexico.

This beautiful species has never been abundant in the collections of the U. S. National Museum.

32603. Key West, Florida. J. A. Henshall.

89. Diabasis chromis (Brouss.) Jor. & Gilb.

West Indies; Florida Keys.

3386. Garden Key, Florida. Whitehurst.

90. Diabasis jemiguano (Poey) Goode & Bean.

Cuba; Florida Keys.

3103. Garden Key, Florida. Whitehurst.

91. Orthopristis fulvomaculatus (Mitch.) Gill. PIG-FISH.

Atlantic coast of the United States from Virginia to Florida; Gulf of Mexico.

This is a food-fish of small size and comparatively little importance; its flesh, however, is good; the species is common from Norfolk, Virginia, southward.

31034. Galveston, Texas. Prof. D. S. Jordan.

92. Anisotremus virginicus (L.) Gill.

Atlantic coast of the southern United States; Gulf of Mexico.

This is a beautiful fish, but it is, apparently, not sufficiently plentiful on our coast to have commercial importance.

21428. Key West, Florida. Wm. Stimpson.

93. Lutjanus blackfordii Goode & Bean. RED SNAPPER; PARGO COLORADO.

Lutjanus campeachianus JOR. & GILB. (not of Poey).

Gulf of Mexico.

This fine fish reaches a weight of 35 pounds; it is the most important species of the Pensacola market; in New Orleans, according to Jordan & Gilbert, it is sold in greater quantities than all other species combined. The Red Snapper has, within the last few years, become well known in New York, and even in Washington markets.

30681. Pensacola, Florida. Silas Stearns.

94. Lutjanus caxis (Schn.) Poey. GRAY SNAPPER; BLACK SNAPPER; LAWYER; YELTING; GLASS-EYED SNAPPER (Bermudas).

? Atlantic coast of the southern United States; Gulf of Mexico; Caribbean Sea; West Indies; Bermudas.

This fish is said to reach a length of four feet at the Bermudas (Goode), where it is much esteemed as a food-fish. It is everywhere extremely difficult to catch by any ordinary means.

30168. Pensacola, Florida. Silas Stearns.

95. Lutjanus synagris (L.) Poey.

Mesoprion uninotatus POEY, Syn. Pisc. Cub., p. 294; GÜNTHER, Cat. Fish. Brit. Mus., i, p. 202.

West Indies; Gulf of Mexico.

The species is not rare on the west coast of Florida.

30173. Pensacola, Florida. Silas Stearns.

96. Lutjanus stearnsii Goode & Bean. MANGROVE SNAPPER.

Gulf of Mexico; East Florida.

This species is not uncommon at Pensacola, and Mr. Earll found it about the same in Indian River. Our largest examples in the Museum are nearly two feet long.

25121. Indian River, Florida. R. E. Earll.

CENTRARCHIDÆ.

97. Lepomis punctatus (C. & V.) Jordan. CHINQUAPIN PERCH.

Lepiopomus apiatus GOODE, Proc. U. S. Nat. Mus., II, p. 114, Sept. 19, 1879.

Known from streams of Florida only.

18481. Saint John's River, Florida. G. Brown Goode.

98. Lepomis auritus (L.) Raf. subsp. **solis** C. & V. RED-BELLIED PERCH; LONG-EARED SUNFISH.

In all streams east of the Alleghanies, from Virginia southward, extending into Louisiana; everywhere abundant and reaching a larger size than the northern *auritus*.

17949. Saint John's River, Florida. Prof. S. F. Baird.

99. Lepomis pallidus (Mitch.) Gill. & Jor. BLUE SUNFISH; COPPER-NOSED BREAM; DOLLARDEE..

Lepiopomus incisor GOODE, Proc. U. S. Nat. Mus., vol. II, p. 114, Sept. 19, 1879.

Great Lakes to Florida on both sides of the Alleghanies; Mexico (McKay).

Abundant and exceedingly variable, growing larger and more changeable southward.

21289. Saint John's River, Florida, April, 1878. G. Brown Goode.

100. Lepomis holbrookii (C. & V.) McKay. SOUTHERN BREAM.

Pomotis speciosus HOLBROOK, Journ. Acad. Nat. Sci. Phila., 1855, p. 48.
Pomotis microlophus GÜNTHER, Cat. Fish. Brit. Mus., I, 1859, p. 264.

All streams from South Carolina to Florida.

This bream is very common in Florida and grows to a length of nearly one foot.

21292. Saint John's River, Florida, April, 1878. G. Brown Goode.

101. Micropterus salmoides (Lac.) Henshall. TROUT; BAYOU BASS; LARGE-MOUTHED BLACK BASS.

Red River of the North; rivers and lakes of the United States from the Great Lakes to Florida and Texas.

This species is generally abundant and grows to a larger size than the small-mouthed bass; it is especially common west of the Alleghanies and in the Southern States; it is an important food-fish and affords considerable sport to anglers.

32628. Wekiwachee River, Florida. Dr. J. A. Henshall.

SERRANIDÆ.

102. Epinephelus morio (C. & V.) Gill. RED GROUPER; CHERNA DE VOVERO (Cuba).

West Indies; Atlantic coast of the Southern United States; Gulf of Mexico.

This is a food-fish of large size, reaching 30 pounds in weight.

32604. Key West, Florida. Dr. J. A. Henshall.

103. Trisotropis stomias Goode & Bean. BLACK GROUPER.

Gulf of Mexico.

Specimens of this species have been obtained from the markets of New York and Washington, but all of them, doubtless, came from Pensacola. The fish reaches the weight of 40 pounds; it is abundant, and has some commercial importance.

30683. Pensacola, Florida. Silas Stearns.

104. Serranus atrarius (L.) Jor. & Gilb. SEA BASS; BLACK WILL.

Centropristis atrarius (L.) Barn.

South Carolina to Florida.

This is the southern form of the Sea Bass; the differences between it and *S. nigricans* of the northern coast, which were formulated by Holbrook, are real and make it necessary to consider the two forms under different names. *S. atrarius* is a food-fish of comparatively small size but excellent quality.

18033. Matanzas River Inlet, Florida. J. C. Willetts.

105. Serranus trifurcus (L.) Jor. & Gilb.

Atlantic coast of the United States from South Carolina to Florida; Gulf of Mexico. Nowhere common so far as known.

The Pensacola specimens are taken mostly on the "Red Snapper" banks off Pensacola; they show some differences from Charleston examples.

30713. Pensacola, Florida. Silas Stearns.

106. Diplectrum fasciculare (C. & V.) Holbrook. SQUIRREL-FISH; SERRANO (Cuba).

West Indies; Gulf of Mexico; Atlantic coast of the United States from South Carolina to Florida.

This is a beautiful food-fish, of rather small size, but comparatively common.

6021. Florida. J. Gilliss.

EPHIPPIIDÆ.

107. Chætodipterus faber (Brouss.) Jor. & Gilb. MOON-FISH; ANGEL-FISH; 3-BANDED SHEEPHEAD; 3-TAILED PORGY; PORGEE.

Atlantic coast of the United States from New York to Florida; Gulf of Mexico; West Indies; warm portions of the Pacific north to San Diego (Jordan & Gilbert).

A fine food-fish, which grows to the length of two feet; within the last two years it has greatly increased in the markets of Washington and is now quite popular.

30186. Pensacola, Florida. Silas Stearns.

POMATOMIDÆ.

108. Pomatomus saltatrix (L.) Gill. BLUEFISH; GREENFISH; SKIPJACK; SALT-WATER TAILOR; HORSE-MACKEREL; SNAPPING-MACKEREL.

Atlantic coast of the United States north to Maine; Gulf of Mexico.

This is a food-fish of great importance; it is a predaceous species which destroys large quantities of other fishes, particularly the menhaden.

18046. Saint John's River, Florida. Prof. S. F. Baird.
21776. Pensacola, Florida. Silas Stearns.

ELACATIDÆ.

109. Elacate canadus (L.) Holbrook. CRABEATER; BONITO; COBIA; SERGEANT-FISH; SNOOKS; LING.

Atlantic coast of the United States from Cape Cod to Florida; Gulf of Mexico; West Indies.

This species reaches a length of 5 feet; on the coast of Virginia it is one of the important food-fishes (McDonald).

30150. Pensacola, Florida. Silas Stearns.

ECHENEIDIDÆ.

110. Echeneis naucrates Linné. REMORA; SUCKER-FISH; PEGADOR.

Seas of the temperate and tropical regions; on the coast of the United States it is recorded as far north as the mouth of the Merrimac River, Northern Massachusetts (Putnam).

32598. Big Sarasota Bay, Florida. Dr. J. A. Henshall.

MUGILIDÆ.

111. Mugil albula Linné. STRIPED MULLET.

Atlantic coast of the United States from Cape Cod to Florida; recorded once at Provincetown, Massachusetts; Gulf of Mexico.

This fish is everywhere abundant from Cape Cod southward and is much esteemed in the Southern States. If, as Jordan & Gilbert state, *M. mexicanus* Steind. is not different from *M. albula*, the above distribution must be enlarged to include the "Pacific coast, chiefly south of Point Concepcion."

21285. Saint John's River, Florida. G. B. Goode.

112. Mugil brasiliensis Agassiz. WHITE MULLET; LIZA.

Atlantic coast from Cape Cod to South America; recorded by Jordan & Gilbert in the Pacific north to Lower California.

This species does not reach as large size on the east coast as *M. albula*.

25122. Indian River, Florida. R. E. Earll.

ATHERINIDÆ.

113. Menidia dentex Goode & Bean. FRIAR; SILVERSIDES.

Atlantic coast of the Southern United States, entering streams.

The types are from Saint John's River, Florida; the species extends farther north. This is considered by Jordan & Gilbert to be identical with *M. boscii* (C. & V.). I cannot agree with them in this belief. The silversides are excessively numerous and serve as food for larger fishes.

18051. Saint John's River, Florida. S. F. Baird.

114. Menidia peninsulæ (Goode & Bean) Jor. & Gilb. FRIAR; SILVERSIDES.

Florida.

The range of this species northward is not known to be so far as that of *M. dentex*; the fish is abundant at Pensacola.

30772. Pensacola, Florida. Silas Stearns.

115. Menidia vagrans (Goode & Bean) Jor. & Gilb. SILVERSIDES; FRIAR.

Atlantic coast of the United States from Virginia to Florida; Gulf of Mexico.

30918. Galveston, Texas. D. S. Jordan.

116. Atherina velieana Goode & Bean.

Florida Keys, Gulf of Mexico.

Some fine examples of this species remained in the National Museum undescribed for many years, and were not observed until after Dr. Velie's small specimen from Clear Water Harbor had served as the basis of a description.

1755. Garden Key, Florida. Captain Woodbury.

BELONIDÆ.

117. Tylosurus marinus (Bl. Schn.) Jor. & Gilb. GAR-FISH; BILL-FISH; NEEDLE-FISH; SILVER GAR-FISH.

Belone longirostris, GOODE, Proc. U. S. Nat. Mus. ii, p. 116, September 19, 1879.

Atlantic coast of the United States from Maine to Florida, southward to Brazil; Gulf of Mexico.

This species ascends far up the streams. It reaches a length of nearly 4 feet. In Washington market it is occasionally offered for sale without the head; but the green bones make it unpopular.

32516. Florida. J. W. Milner.

118. Tylosurus notatus (Poey) Jor. & Gilb.

West Indies; Gulf of Mexico.

32600. Charlotte Harbor, Florida. J. A. Henshall.

SCOMBRESOCIDÆ.

119. Exocœtus mesogaster Bloch. FLYING-FISH.

Exocœtus hillianus GOSSE, Nat. Sojourn Jam., p. 11, tab. 1, fig. 1.

West Indies; Gulf of Mexico; Atlantic coast of the United States, north to South Carolina.

This species is not uncommon at Pensacola; judging from the museum collections it is more abundant there than any other species.

31907. Pensacola, Florida. Silas Stearns.

120. Hemirhamphus unifasciatus Ranz.

Atlantic coast from Cape Cod to Panama; common on the coast of the Southern United States; Gulf of Mexico.

26566. Florida. Silas Stearns.

ESOCIDÆ.

121. Esox americanus Gmel. BANDED PICKEREL.

United States east of the Alleghanies from Massachusetts to Florida, generally abundant.

This is one of the small pickerel, not much exceeding 12 inches in length.

32626. Elbow Creek, trib. of Indian River, Florida. Dr. J. A. Henshall.

CYPRINODONTIDÆ.

122. Jordanella floridæ Goode & Bean.

East Florida, not collected in abundance anywhere.

32257. Jupiter Inlet, Dade Co., Florida. Dr. J. A. Henshall.

123. Cyprinodon variegatus Lac.

Atlantic coast of the United States from Cape Cod to Florida, entering streams, everywhere abundant.

32594. Jupiter Inlet, Dade Co., Florida. Dr. J. A. Henshall.

124. Cyprinodon gibbosus Baird & Girard.

Gulf of Mexico, abundant.

30758. Pensacola, Florida. Silas Stearns.

125. Cyprinodon elegans Baird & Girard.

Rio Grande River, Texas.

This species has not been obtained recently by collectors; it must, however, be plentiful where it was originally discovered.

21321. Camanche Springs, N. Rio Grande. J. H. Clark.

126. Cyprinodon mydrus Goode & Bean.

Gulf of Mexico.

This species was first obtained at Pensacola by Mr. Stearns; it does not seem to be abundant.

31931. Pensacola, Florida. Silas Stearns.

127. Fundulus majalis (Walb.) Günther. KILLIFISH; MUMMICHOG; MAY-FISH; BASS-FRY; ROCK-FISH.

Atlantic coast of the United States from Salem, Massachusetts, to Florida.

This species is very abandant in shallow and brackish waters. It is the largest of the cyprinodonts.

8186. Indian River, Florida. Gustavus Würdemann.

128. Fundulus similis (B. & G.) Gthr.

Atlantic coast of the United States from South Carolina southward; Gulf of Mexico; ascending streams.

As suggested by the name there is no difference in the colors of the sexes.

30780. Pensacola, Florida. Silas Stearns.

129. Fundulus seminolis Girard. FLORIDA MUMMICHOG; MINNOW.

East Florida.

This handsome species appears to be uncommon in collections. The National Museum has seldom received it from its collectors in Florida.

18067. Lake Monroe, Florida. Prof. S. F. Baird.

130. Fundulus grandis Baird & Girard. KILLIFISH; MUMMICHOG; SALT-WATER MINNOW.

Atlantic coast of Southern United States, chiefly southward; Gulf of Mexico.

This may be only a large race of *F. heteroclitus* (L.) Gthr., the common killifish of the Northern United States; but it differs constantly from this in the small dorsal fin, size, and other characters.

30834. Pensacola, Florida. Jordan & Stearns.

131. Fundulus ocellaris Jor. & Gilb.

Gulf of Mexico; known from Pensacola Bay, where it is abundant.

30781. Pensacola, Florida. Silas Stearns.

132. Fundulus xenicus Jor. & Gilb.

Adinia multifasciata, GIRARD. Proc. Acad. Nat. Sci. Phila., 1859, p. 117.

Gulf of Mexico.

This is a small, but elegant, species not much resembling in general appearance the other members of the genus; "locally very abundant in shallow lagoons" (Jordan & Gilbert).

30841. Pensacola, Florida. Jordan & Stearns.

133. Zygonectes craticula Goode & Bean.

Southern United States, from Georgia to Florida.

This beautiful little species is evidently very closely related to *Z. zonatus* (Mitch.)—*Haplochilus zonatus* (Günther)—and may not be distinct from it. We know too little about *Z. zonatus*, however, to determine this matter at present.

31439. (1 of the type specimens.) Tributary of Indian River, Florida. J. A. Henshall.

134. Zygonectes henshallii Jordan.

Streams of East Florida.

This, the largest species of the genus, was made known by Prof. Jordan in January, 1880, from examples collected in San Sebastian River by Dr. Henshall; it bears a very close resemblance to *Z. rubrifrons*, described in the same paper, but the dentition and coloration are said to be different. The single typical example of each of these species in the Museum are not sufficient to determine their relations, which deserve further investigation.

32627. Elbow Creek, trib. of Indian River, Florida. Dr. J. A. Henshall.

135. Lucania goodei Jordan.

Streams of East Florida.

23505. (2 of the type specimens.) Saint John's River, Florida. G. B. Goode.

136. Lucania venusta Girard.

Gulf coast of the United States.

This species may be readily distinguished from the more northern *L. parva* by the larger number of rays in its dorsal and anal fins.

30714. Pensacola, Florida. Silas Stearns.

137. Gambusia patruelis (B. & G.) Girard.

Heterandria holbrookii AGASSIZ MSS.

Gambusia holbrookii GIRARD, Proc. Acad. Nat. Sci. Phila., 1859, p. 61; GÜNTHER, Cat. Fish. Brit. Mus., vi, 1866, p. 334.

United States from Maryland to Texas, mostly in brackish water; ascending streams; credited also to Mexico.

"The young are produced in early summer, when about one-third of an inch long" (Jordan & Gilbert).

32596. Jupiter Inlet, Dade County, Florida. Dr. J. A. Henshall.

138. Mollienesia latipinna Le Sueur.

Pœcilia lineolata GIRARD, U. S. & Mex. Bound. Surv., Ichth., 1859, p. 70.

Limia matamorensis GIRARD, Proc. Acad. Nat. Sci. Phila., 1859, p. 116.

Florida to Mexico; abundant in brackish water and ascending streams.

32595. Jupiter Inlet, Dade County, Florida. Dr. J. A. Henshall.

139. Girardinus formosus Agassiz.

Southern United States from South Carolina to Florida.

This is said to be the smallest of known fishes.

23506. Saint John's River, Florida. G. B. Goode.

SYNODONTIDÆ.

140. Trachinocephalus myops (Forster) Gill.

Atlantic coast of the United States from Cape Cod to Florida Keys; tropical parts of the Atlantic.

This species has occasionally appeared as far north as Wood's Holl, Massachusetts; it is rare on our Atlantic coast.

5833. (R.) Garden Key, Florida. Whitehurst.

ALBULIDÆ.

141. Albula vulpes (L.) Goode. LADY-FISH; BONE-FISH.

Pelagic; tropical and subtropical seas.

On our Atlantic coast the lady-fish has been taken as far north as Wood's Holl, Cape Cod; it is abundant southward; reaches a length of two feet; but is not an important food-fish.

30158. Pensacola, Florida. Silas Stearns.

142. Elops saurus Linné. BIG-EYED HERRING; LADY-FISH.

Tropical and subtropical seas. On the Atlantic coast of the United States it ranges north to Cape Cod occasionally; southward to Gulf of Mexico.

We have received examples nearly two feet long. It is not a food-fish; but at Pensacola it is extensively salted as bait for the Red Snapper (*Lutjanus blackfordii*).

30149. Pensacola, Florida. Silas Stearns.

CLUPEIDÆ.

143. Brevoortia tyrannus (Latrobe) Goode. MENHADEN; BUG-FISH; MOSSBUNKER; BONY-FISH; POGIE.

Atlantic coast of the United States from Maine to East Florida.

A species of great commercial importance on account of its excellence as bait and as affording oil and a basis of fertilizers; the young are extensively canned as sardines. This species is quite distinct from the next as will be evident to any one who has a sufficient series for examination.

32610. Florida. J. W. Milner.

144. Brevoortia patronus Goode. GULF MENHADEN; ALEWIFE; BUG-FISH.

Gulf of Mexico.

This species is smaller than the last and has no economic importance; its maximum length is little more than a foot so far as we can determine from our material.

22808. Pensacola, Florida. Silas Stearns.

145. Harengula pensacolæ Goode & Bean.

Gulf of Mexico. Mr. Silas Stearns has recently sent a great number of examples of this species from Pensacola.

5999. Garden Key, Florida. Whitehurst.

146. Clupea chrysochloris (Raf.) Jor. & Gilb. OHIO SHAD; SKIPJACK; BLUE HERRING.

Gulf of Mexico; Mississippi Valley, and from thence through the canals into Lake Erie (Jor. & Gilb.) and Lake Michigan (Jor. & Gilb.).

The species is not rare in the Gulf of Mexico; Mr. Stearns has found it in moderate numbers at Pensacola.

30159. Pensacola, Florida. Silas Stearns.

DOROSOMATIDÆ.

147. Dorosoma cepedianum (Le S.) Gill. GIZZARD SHAD; MUD SHAD; HICKORY SHAD; TOOTHED HERRING.

The United States from the Mississippi Valley eastward; north to Cape Cod, south to Texas and extending into Mexico; becoming land-locked in ponds and introduced through canals into Lakes Erie and Michigan.

The species has no commercial value.

31035. Galveston, Texas. Prof. D. S. Jordan.

CATOSTOMIDÆ.

148. Erimyzon goodei Jordan.

Rivers and lakes of Florida.

This is a handsome species which was found several years ago by Mr. Goode; it is abundant; the largest examples received are nearly a foot in length.

31383. Lake Monroe, Florida. R. E. Earll.

CYPRINIDÆ.

149. Notemigonus americanus (L.) Jordan. SOUTHERN BREAM; SHINER; ROACH.

Rivers of the South Atlantic States.

The species of *Notemigonus* are useful as bait; they are exceedingly variable and unsatisfactory to determine.

32599. San Sebastian River, Florida. Dr. J. A. Henshall.

SILURIDÆ.

150. Arius felis (L.) Jor. & Gilb. SEA CAT-FISH; BLUE CAT.

Atlantic coast of the United States from Cape Cod to Florida; Gulf of Mexico.

The species is quite uncommon northward and common in the southern portion of its habitat; it reaches a length of two feet.

32619. Florida. J. W. Milner.

ANGUILLIDÆ.

151. Neoconger mucronatus Girard.

Coast of Texas.

The species has not been obtained by recent collectors.

861. (R.) (One of the five types of the species.) Saint Joseph's Island, Texas. G. Würdemann.

152. Anguilla rostrata (Le S.) DeKay. COMMON EEL; FRESHWATER EEL.

Atlantic coast of the United States ascending streams; Mississippi Valley; Gulf coast and southward to Mexico; introduced into California.

The U. S. National Museum has an example from the Potomac River 41 inches long and 11 inches in circumference.

32609. Florida. J. W. Milner.

MURÆNIDÆ.

153. Crotalopsis mordax (Poey) Goode & Bean.

West Indies; Gulf of Mexico.

23635. Clear Water Harbor, Florida. Dr. J. W. Velie.

154. Sphagebranchus teres Goode & Bean.

Gulf of Mexico.

The types of the species have been in the Museum many years; but were only recently described.

31457. (R.) (One of three typical examples.) West Florida. Kaiser & Martin.

155. Letharchus velifer Goode & Bean.

Gulf of Mexico.

The species was collected many years ago, but has been only recently described. Collectors have not lately obtained it.

31458. (R.) (One of the four typical specimens.) West Florida. Kaiser & Martin.

156. Gymnothorax ocellatus Agassiz.

Gulf of Mexico and southward.

The species is not uncommon at Pensacola and is found in stomachs of the Red Snapper.

5160. West Florida. Kaiser & Martin.

TRYGONIDÆ.

157. Trygon sabina Le Sueur.

East Florida; not uncommon in Lake Monroe in fresh water; Gulf of Mexico.

31045. Galveston, Texas. Prof. D. S. Jordan.

SPHYRNIDÆ.

158. Reniceps tiburo (L.) Gill. SHOVEL-NOSE SHARK; BONNET HEAD.

Atlantic Ocean, abundant off the coast of the Southern United States; the species ranges northward to Cape Cod.

30687. Pensacola, Florida. Silas Stearns.

GALEORHINIDÆ.

159. Scoliodon terræ-novaæ (Rich.) Gill. SHARP-NOSED SHARK.

Atlantic Ocean from Newfoundland to South America; abundant off the coast of the Southern United States.

The species was originally described from Newfoundland, but has not recently been observed so far north This is one of the small sharks.

30706. Pensacola, Florida. Silas Stearns.

GENERA OF FRESH-WATER FISHES.

SYNGNATHIDÆ.

Genus SIPHOSTOMA Rafinesque.

1. Siphostoma affine (Günther) Jor. & Gilb. PIPE-FISH.

Saint John's River, East Florida; Gulf of Mexico.

30827. ♂ & ♀. Pensacola, Florida. Jordan & Stearns.

GASTEROSTEIDÆ.

Genus GASTEROSTEUS Linné.

Subgenus GASTEROSTEUS.

2. Gasterosteus microcephalus Girard. NAKED STICKLEBACK.

Pacific coast of the United States; Alaska north to Unalashka; everywhere ascending streams.

At Sitka we found *Salmo purpuratus* in a small lake feeding upon this species.

7814. San Francisco, California. W. H. Dall.

Subgenus EUCALIA Jordan.

3. Gasterosteus inconstans Kirtland. BLACK STICKLEBACK; BROOK STICKLEBACK.

Eucalia inconstans JORDAN, Proc. Acad. Nat. Sci. Phila., 1877, p. 65.

Northern United States from New York westward to Kansas and Wisconsin; north-eastward to Greenland.

The species is confined to fresh water and is subject to considerable variation.

20430. Waukegan, Illinois. J. W. Milner.

Subgenus PYGOSTEUS Brevoort.

4. Gasterosteus pungitius Linné. TEN-SPINED STICKLEBACK.

Gasterosteus nebulosus AGASSIZ, Lake Superior, 1850, p. 310.

Upper Great Lakes; westward to the Saskatchewan and Great Bear Lake.

This is simply the common *G. pungitius*, slightly modified by long-continued residence in fresh water. It is abundant in some parts of the Great Lakes.

10559. Bayfield, Wisconsin. J. W. Milner.

SOLEIDÆ.

Genus ACHIRUS Lacépède.

5. Achirus lineatus (L.) Cuv. FLAT-FISH; FLOUNDER; AMERICAN SOLE; CALICO-BACK; HOG-CHOKER.

Atlantic coast of the United States from Massachusetts Bay to North Carolina, ascending streams to a distance from salt water.

This is a handsome species, but is not generally used for food; according to Dr. Yarrow it is considered a valuable food-fish at Beaufort, North Carolina.

26429. Saint Jerome's Creek, Maryland. John A. Ryder.

GADIDÆ.

Genus LOTA Cuvier.

6. Lota maculosa (Le Sueur) Richardson. BURBOT; MARTHY; METHY; LOSH; LA LOCHE; EEL-POUT; DOG-FISH; CHUB-EEL; LING; LAWYER; LAKE CUSK; FRESH-WATER COD; ALEBY TROUT; MOTHER OF EELS.

North America south to the Susquehanna River in the East and Kansas City, Missouri, in the West; recently found on Kodiak Island, Alaska.

The Burbot spawns in late winter or early spring; it reaches the largest size in the Yukon; in most sections it is considered unfit for food.

20977. Outer Island, Lake Superior. J. W. Milner.

GOBIIDÆ.

Genus GOBIOSOMA Girard.

7. Gobiosoma boscii (Lac.) Jor. & Gilb.

Gobius alepidotus BL. & SCHN., 1801, p. 547.
Gobiosoma molestum GIRARD, Proc. Acad. Nat. Sci. Phila., 1858, p. 169; GÜNTHER, Cat. Fish. Brit. Mus., iii, 1861, p. 556.

Atlantic coast of the United States, ascending streams; Gulf of Mexico; reported to have been taken once at the Falls of the Ohio.

30251. Potomac River (Gunston's). Col. M. McDonald.

COTTIDÆ.

Genus URANIDEA De Kay.

8. Uranidea marginata Bean.

Washington Territory.

24197. (One of the typical specimens.) Walla Walla, Washington Territory. Capt. Charles Bendire, U. S. A.

Genus COTTOPSIS Girard.

9. Cottopsis semiscaber Cope.

Idaho (Cope); Utah Lake (Jordan).

30808. Utah Lake, Utah. Peter Madsen.

Genus POTAMOCOTTUS Gill.

10. Potamocottus punctulatus Gill.

Wyoming Territory.

22110. Fort Bridger, Wyoming. F. Hirst.

Genus TRIGLOPSIS Girard.

11. Triglopsis thompsoni Girard.

The Great Lakes, in deep water.

This apparently rare species has not, for many years, been received by the U. S. National Museum. Good specimens are greatly desired.

15032. Racine, Lake Michigan. Dr. P. R. Hoy.

CICHLIDÆ.

Genus HEROS Heckel.

12. Heros cyanoguttatus (B. & G.) Günther.

Herichthys cyanoguttatus B. & G., Proc. Acad. Nat. Sci. Phila., 1854, p. 25.

Rivers of Texas and Mexico.

850. (R.) (One of the types of the species.) Devil's River (Rio Grande), Texas. J. D. Graham.

EMBIOTOCIDÆ.

Genus HYSTEROCARPUS Gibbons.

13. Hysterocarpus traskii Gibbons.

Rivers of Central California, locally abundant (Jordan & Gilbert).

This is the only American *Embiotocoid* that is known to inhabit fresh waters.

27013. Sacramento River, California. Prof. D. S. Jordan

SCIÆNIDÆ.

Genus HAPLOIDONOTUS Rafinesque.

14. Haploidonotus grunniens Rafinesque. FRESH-WATER SHEEPSHEAD; DRUM; WHITE PERCH; CROAKER; THUNDER-PUMPER; GASPERGOU.

Great Lakes; Mississippi Valley; Texas.

This is an abundant, but comparatively worthless fish, which grows to the weight of about 60 pounds; the flesh of the adult is coarse and tough, and in the Great Lake region is disliked; the young, however, are more esteemed, especially southward.

10542. Ecorse, Michigan. J. W. Milner.

ELASSOMATIDÆ.

Genus ELASSOMA Jordan.

15. Elassoma zonatum Jordan.

Sluggish streams and bayous from South Illinois to Texas and Alabama (Jordan & Gilbert), also in rivers that are not sluggish.

Specimens from Louisiana show considerable variation in colors and proportions from the types of the species. This little fish is rare in collections.

32423. New Orleans, Louisiana, November 16, 1882. Dr. R. W. Shufeldt.

CENTRARCHIDÆ.

Genus CENTRARCHUS Cuv. & Val.

16. Centrarchus macropterus (Lac.) Jordan. SHINING BASS.

North Carolina to Illinois and southward to Alabama and Florida.

This attractive fish is frequently seen in Washington markets in winter, coming here from North Carolina with *Pomoxys*, *Chænobryttus*, and species of *Lepomis*.

20395. Kinston, North Carolina. H. W. Welsher.

Genus POMOXYS Rafinesque.

17. Pomoxys sparoides (Lac.) Girard. STRAWBERRY BASS; GRASS BASS; CALICO BASS; BARFISH; GOGGLE-EYE; GOGGLE-EYE PERCH; STRAWBERRY PERCH.

Great Lakes and Upper Mississippi Valley, southward to Louisiana; in the Eastern United States from New Jersey to Florida.

This species reaches a length of one foot and is esteemed as a food-fish.

30313. Fulton Market, New York. E. G. Blackford.

Genus ARCHOPLITES Gill.

18. Archoplites interruptus (Girard) Gill. SACRAMENTO PERCH.

Sacramento and San Joaquin Rivers (Jordan & Gilbert).

This species rivals the preceding in size and is, likewise, a food-fish. It is "the only fresh-water percoid west of the Rocky Mountains" (Jordan & Gilbert).

27137. San Francisco, California. Jordan & Gilbert.

Genus AMBLOPLITES Rafinesque.

19. Ambloplites rupestris (Raf.) Gill. ROCK BASS; RED-EYE; GOGGLE-EYE.

Eastern United States from Vermont southward; Great Lake region, and west to Manitoba; Mississippi Valley south to Louisiana.

This is a food-fish of some importance. An example 14 inches long was received April 13, 1882, from J. W. Bronaugh of Manchester, Virginia.

10549. Buffalo, New York. J. W. Milner.

Genus CHÆNOBRYTTUS Gill.

20. Chænobryttus gulosus (C. & V.) Jordan. WAR-MOUTH; RED-EYED BREAM; WAR-MOUTH PERCH; YAW-MOUTH.

Eastern United States from Virginia to Florida and extending, in the Gulf States, to Texas.

The species is small, reaching 9 inches in length, but is extensively sold in the markets.

23509. McBean, Georgia. A. Graves.

Genus ACANTHARCHUS Gill.

21. Acantharchus pomotis (Baird) Gill. MUD SUN-FISH.

Eastern United States from New York to South Carolina, in sluggish streams.

This is a small, but handsome species, reaching 5 inches or more in length; it is too small to have much value as a food-fish.

24774. Kinston, North Carolina. H. W. Welsher.

Genus ENNEACANTHUS Gill.

22. Enneacanthus pinniger Jordan.

North Carolina, in streams near the coast.

The typical *pinniger* from North Carolina is, in my opinion, sufficiently distinguished from the New Jersey form to retain the name proposed for it by Prof. Jordan. The intergradation between the two has not yet been shown.

20491. Kinston, North Carolina. Mason & Quinn.

Genus MESOGONISTIUS Gill.

23. Mesogonistius chætodon (Baird) Gill. BLACK-BANDED SUN-FISH.

New Jersey to Maryland, in sluggish streams (Jor. & Gilb.).

20354. Trenton, New Jersey. Dr. C. C. Abbott.

Genus LEPOMIS Rafinesque.

Subgenus APOMOTIS Rafinesque.

24. Lepomis cyanellus Raf. RED-EYE; BLUE-SPOTTED SUN-FISH.

Apomotis cyanellus JORDAN, Man. Vert. E. U. S., ed. 2, p. 239.

Great Lake Region; Mississippi Valley and southward to Mexico.

20052. Cumberland River, Tennessee. A. Winchell.

Subgenus LEPOMIS Rafinesque.

25. Lepomis auritus (L.) Raf. LONG-EARED SUN-FISH.

Eastern United States east of the Alleghanies from Maine to Florida.

The species is everywhere abundant, and though seldom exceeding 8 inches in length, it is extensively eaten.

4306. Bucks County, Pennsylvania. J. H. Richard.

Subgenus XENOTIS Jordan.

26. Lepomis megalotis (Raf.) Cope. LONG-EARED SUN-FISH.

Xenotis megalotis JORDAN, Man. Vert. E. U. S., ed. 2, p. 242.

Mississippi Valley.

It it is claimed that this variable species includes fully a dozen other forms which have received distinct names, as may be seen by referring to Proc. U. S. Nat. Mus., iv, p. 89, or to Bull. 16, U. S. Nat. Mus., 1883, p. 478.

20150. White River, Indiana. Prof. D. S. Jordan.

Subgenus HELIOPERCA Jordan.

27. Lepomis pallidus (Mitch.) Gill & Jordan. BLUE SUN-FISH; COPPER-NOSED BREAM; DOLLARDEE; BLUE-NOSED BREAM.

Great Lakes; Mississippi Valley; southeastern United States to Florida; southward to Mexico.

This species is very abundant and exceedingly variable; it reaches 8 inches in length and is largely eaten.

8410. Pine Lake, Ingham County, Michigan.

Subgenus XYSTROPLITES Jordan.

28. Lepomis heros (B. & G.) McKay.

Xystroplites heros JORDAN, Man. Vert. E. U. S., ed. 2, p. 244.

Originally known from Texas.

In December, 1879, the U. S. National Museum received four individuals of a sun-fish from Georgia (one of them is in the collection exhibited) which appear to me to agree with the types of *Pomotis heros*. If my determination be correct, we must extend the range of the species eastward to Georgia.

23510. McBean, Georgia. A. Graves.

Subgenus EUPOMOTIS Gill & Jordan.

29. Lepomis gibbosus (L.) McKay. COMMON SUN-FISH; BREAM; PUMPKIN-SEED; SUNNY; RUFF; MOCCASIN; TOBACCO-BOX; POND-FISH.

Eupomotis aureus Auctorum.

Eastern United States, east of the Alleghanies, from Maine to Florida; Great Lake region; Upper Mississippi Valley.

This is a beautiful little fish, the cherished victim of the youthful angler.

4163. Root River, Wisconsin. Prof. S. F. Baird.

Genus MICROPTERUS Lacépède.

30. Micropterus dolomiei Lacépède. SMALL-MOUTHED BLACK BASS.

Great Lake region; Mississippi Valley south to Arkansas; introduced into the eastern United States and now becoming abundant from New England to South Carolina.

This is a beautiful and hardy game fish, extensively taken by artificial as well as natural baits, and largely sold in the markets.

20549. Scioto River, Ohio.

PERCIDÆ.

Genus PERCA Linné.

31. Perca americana Schranck. YELLOW PERCH; AMERICAN PERCH; RINGED PERCH; YELLOW NED.

Great Lake region and west to Manitoba; eastern United States from New England to Florida, east of the Alleghanies.

This is a food-fish of considerable importance; in the region near the mouth of the Susquehanna River it comes into the creeks in February to spawn, finishing in March, when it departs to the "flats"; it reaches 2 pounds in weight.

20456. Susquehanna River. Wilkes-Barre, Pennsylvania. Dr. L. H. Taylor.

Genus STIZOSTEDIUM Rafinesque.

Subgenus STIZOSTEDIUM Rafinesque.

32. Stizostedium vitreum (Mitch.) Jordan & Copeland. Var. **salmoneum** Raf. BLUE PIKE.

Ohio and southward, in the Mississippi Valley, to Louisiana.

The "blue pike" is smaller than typical *vitreum*, and takes its name from its color; it is an abundant and excellent food-fish.

31464. Valley Falls, Kansas. J. L. Whitman.

Genus AMMOCRYPTA Jordan.

33. Ammocrypta pellucida (Baird) Jor. & Gilb. SAND DARTER.

Etheostoma pellucidum BAIRD MSS.; *Pleurolepis pellucidus* AGASSIZ, Bull. Mus. Comp. Zoöl., I, 1863, p. 5; JORDAN, Man. Vert. E. U. S., ed. 2, p. 219.

Ohio Valley and northwestward; abounding in clear sandy streams (Jordan & Gilbert).

20127. White River, Indiana. Prof. D. S. Jordan.

Genus BOLEOSOMA De Kay.

34. Boleosoma olmstedii (Storer) Agassiz. TESSELLATED DARTER.

Great Lake region; Eastern United States from Massachusetts to Georgia.

17823. Susquehanna River, Bainbridge, Pennsylvania. Dr. T. H. Bean.

Genus VAILLANTIA Jordan.

35. Vaillantia chlorosoma Hay.

? *Vaillantia camura* (FORBES) *fide* JORDAN.

Ohio Valley; Mississippi Valley.

The above is the correct distribution if *camura* and *chlorosoma* are identical, and the proper name would be *Vaillantia camura* (Forbes) Jordan.

27428. Tuscumbia River, Mississippi. O. P. Hay.

Genus ULOCENTRA Jordan.

36. Ulocentra stigmæa Jordan. SPECK.

"Georgia to Louisiana; rather common in the ponds and streams of the hill country" (Jordan & Gilbert).

31108. Etowah River, Georgia. Jordan & Brayton.

Genus DIPLESIUM Rafinesque.

37. Diplesium blennioides (Raf.) Jordan. GREEN-SIDED DARTER.

Mississippi Valley; said to include *Pileoma cymatogramma* Abbott, *Hyostoma blennioperca* Cope, and *H. newmani* Agassiz, in which case the distribution must be extended to include the Eastern United States from Pennsylvania southward.

1307. Black River, Ohio. Prof. S. F. Baird.

Genus COTTOGASTER Putnam.

38. Cottogaster copelandii Jordan.

Rheocrypta copelandii JORDAN, Bull. U. S. Nat. Mus. No. 10, 1877, p. 9, also, in Man. Vert. E. U. S., p. 222.

"White River, Indiana; abundant near Indianapolis" (Jordan & Gilbert).

20143. (R.) (One of the types.) White River, Indiana. D. S. Jordan.

Genus IMOSTOMA Jordan.

39. Imostoma shumardii (Girard) Jordan.

Hadropterus Shumardi GIRARD, Proc. Acad. Nat. Sci. Phila., 1859, p. 100; JORDAN, Man. Vert., ed. 2, p. 222.

Wabash, Illinois, and Arkansas Rivers (Jordan & Gilbert).

17852. Wabash River, Indiana. Prof. D. S. Jordan.

Genus PERCINA Haldeman.

40. Percina caprodes (Raf.) Girard. LOG PERCH; ROCK-FISH; HOG MOLLY; HOG-FISH.

Great Lake region; Mississippi Valley southward to Texas; Eastern United States south at least to Potomac River.

This is the largest of the Darters.

1317. Yellow Creek, Ohio. Prof. S. F. Baird.

Genus ALVORDIUS Girard.

Subgenus ALVORDIUS Girard.

41. Alvordius macrocephalus (Cope) Jordan.

Etheostoma macrocephalum COPE, Trans. Amer. Phil. Soc., 1866, p. 401;
Alvordius macrocephalus, JORDAN; Man. Vert. E. U. S., ed. 2, p. 220.

Ohio Valley.

1194. Foxburg, Pennsylvania. Prof. S. F. Baird.

Subgenus ERICOSMA Jordan.

42. Alvordius evides Jordan & Copeland.

Ericosma evides JORDAN, Bull. U. S. N. M., No. 10, 1877, p. 8.

White River, Indiana.

20119. White River, Indiana. D. S. Jordan.

Genus HADROPTERUS Agassiz.

Subgenus HADROPTERUS Ag.

43. Hadropterus nigrofasciatus Agassiz. CRAWL-A-BOTTOM.

Rivers of the Southern United States from South Carolina to Louisiana (Jordan & Gilbert).

1197. Mobile, Alabama. Prof. L. Agassiz.

Genus NOTHONOTUS Agassiz.

44. Nothonotus maculatus (Kirt.) Agassiz.

Ethcostoma maculata KIRTLAND, Bost. Jour. Nat. Hist., 1840, page 276.

Yellow Creek and Mahoning River, Ohio.

1319. Yellow Creek, Ohio. Prof. S. F. Baird.

Genus NANOSTOMA Putnam.

45. Nanostoma thalassinum Jordan & Brayton.

Nothonotus thalassinus JORD. & BRAYT., Bull. U. S. N. M., No. 12, p. 13, 1878.

Rivers of South Carolina.

31122. (R.) (One of the types.) Saluda River, South Carolina. Jordan & Brayton.

Genus ETHEOSTOMA Rafinesque.

46. Etheostoma lineolatum (Ag.) Jordan. STRIPED DARTER.

Catonotus lineolatus AGASSIZ, Amer. Jour. Sci. Arts, 1854, p. 305.

Upper Mississippi Valley (Minnesota to Indiana); "abounding in clear and rocky streams" (Jordan & Gilbert).

1281. Oconomowoc River, Wisconsin. Prof. S. F. Baird.

Genus PŒCILICHTHYS Agassiz.

Subgenus PŒCILICHTHYS Agassiz.

47. Pœcilichthys spectabilis Agassiz. RAINBOW DARTER.

Mississippi Valley.

Professors Jordan and Gilbert think it probable that this may be a brook variety of *P. cæruleus* (Storer) Agassiz.

20111. White River, Indiana. Prof. D. S. Jordan.

Subgenus BOLEICHTHYS Girard.

48. Pœcilichthys exilis (Girard) Jor. & Gilb.

Boleichthys exilis GIRARD, Proc. Acad. Nat. Sci. Phila., 1859, p. 103.

The distribution is not yet known to extend beyond the locality of the original types.

1336. (R.) (One of the types.) Little Muddy River, tributary of Upper Missouri. Dr. Suckley.

Genus MICROPERCA Putnam.

49. Microperca punctulata Putnam. LEAST DARTER.

Clear streams of the Mississippi Valley southward to Indiana.

20132. Wabash River, Indiana. Prof. D. S. Jordan.

LABRACIDÆ.

Genus ROCCUS Mitchill.

Subgenus ROCCUS Mitchill.

50. Roccus saxatilis (Bl. Schn.) Jor. & Gilb. STRIPED BASS; ROCK; ROCK-FISH.

Roccus lineatus (Bl. Schn.) Gill.

Atlantic coast from the Saint Lawrence to Florida; Gulf of Mexico; ? Lower Mississippi Valley (Bean); everywhere entering rivers.

This is one of the most important of our food-fishes, reaching a length of 4 feet and the weight of 60 pounds; it is a famous game fish.

30375. Chesapeake Bay, March, 1882. U. S. Fish Commission.

32560. Potomac River, March 23, 1883. Dr. T. H. Bean.

Subgenus LEPIBEMA Raf.

51. Roccus chrysops (Raf.) Gill. WHITE BASS; CISCO BASS.

Mississippi Valley; Great Lakes, and northward.

This is a game fish, important as food, reaching a length of 15 inches and weighing as much as 10 pounds.

10326. Sandusky, Ohio. J. W. Milner.

Subgenus MORONE Gill.

52. Roccus americanus (Gmelin) Jor. & Gilb. WHITE PERCH.

Atlantic coast of the United States from Cape Cod to Florida; occasional in Massachusetts Bay.

The White Perch is abundant, ascending streams, and is everywhere esteemed; it seldom exceeds a foot in length, but has considerable commercial value.

1750. Sing Sing, New York. Prof. S. F. Baird.

APHREDODERIDÆ.

Genus APHREDODERUS Le Sueur.

53. Aphredoderus sayanus (Gilliams) De Kay. PIRATE PERCH

The United States from New York southward; west to and throughout the Mississippi Valley.

This species is remarkable for the variations in the position of its vent (see Jordan, Bull. Ill. Lab. Nat. Hist., II, 1878, p. 48), the young having it behind the ventrals, while in the adult it is at the throat.

32197. Vaughan's, Mississippi. O. P. Hay.

ATHERINIDÆ.

Genus MENIDIA Bonaparte.

54. Menidia dentex Goode & Bean.

East Florida.

18051. Saint John's River, Florida. Prof. S. F. Baird.

Genus LABIDESTHES Cope.

55. Labidesthes sicculus Cope. BROOK SILVERSIDE; SKIPJACK; SILVER SKIPJACK.

Upper Mississippi Valley southward to Tennessee, in ponds and sluggish streams.

17871. White River, Indiana. Prof. D. S. Jordan.

BELONIDÆ.

Genus TYLOSURUS Cocco.

56. Tylosurus marinus (Bl. Schn.) Jor. & Gilb. SILVER GARFISH; SOFT GAR; BILL-FISH; NEEDLE-FISH.

Atlantic coast of the United States from Maine to Florida; Gulf of Mexico; south to Brazil.

This species ascends rivers far above tide-water; it reaches a length of 4 feet; it is sometimes offered for sale, in Washington market, with the head cut off. For the embryology of this gar see Ryder, Bull. U. S. Fish Com., I, p. 283.

12960. Potomac River, Washington, D. C. P. L. Jouy.

AMBLYOPSIDÆ.

Genus AMBLYOPSIS De Kay.

57. Amblyopsis spelæus De Kay. BLIND FISH.

Indiana and Kentucky, in subterranean streams.

5863. (R.) ? Mammoth Cave, Kentucky.

Genus TYPHLICHTHYS Girard.

58. Typhlichthys subterraneus Girard.

Kentucky, Tennessee, and Alabama, in subterranean streams.

8563. (R.) Bowling Green, Kentucky. J. E. Younglove.

ESOCIDÆ.

Genus ESOX Linné.

Subgenus PICORELLUS Rafinesque.

59. Esox americanus Gmelin. BANDED PICKEREL; PIKE.

United States east of the Alleghanies from Massachusetts to Florida.

In length this pickerel seldom exceeds one foot.

1587. Piermont, New York. Prof. S. F. Baird.

Subgenus ESOX Linné.

60. Esox lucius Linné. PIKE; LAKE PIKE; GRASS PIKE.

Northern North America, Europe, and Asia; in the Mississippi Valley extending south to Illinois River; its distribution northeastward along the Atlantic side is unknown.

This is a well-known game fish and is very important commercially. The supply for the Washington markets is brought mostly from the Great Lakes.

11142. Sandusky, Ohio. J. W. Milner.

32584. Michigan. Frank N. Clark.

UMBRIDÆ.

Genus UMBRA Müller.

61. Umbra pygmæa (De Kay). MUD DACE; PIGMY DACE; MUD MINNOW; DOG-FISH.

Eastern United States from New York to South Carolina.

This mud minnow is quite distinct from *U. limi* (Kirt.) and should not be confounded with it.

20008. Kinston, North Carolina. J. W. Milner.

Genus DALLIA Bean.

62. Dallia pectoralis Bean. BLACK-FISH.

Northern Alaska (Saint Michael's and Port Clarence).

This is a food-fish of great importance, on account of its good qualities and enormous abundance; it inhabits boggy places where there is little depth of water and is little affected by freezing.

6661. (One of the type specimens.) Saint Michael's, Alaska. H. M. Bannister.

CYPRINODONTIDÆ.

Genus JORDANELLA Goode & Bean.

63. Jordanella floridæ Goode & Bean.

Streams of Central and East Florida, originally known from Lake Monroe.

32557. Jupiter Inlet, Florida, 1882. Dr. J. A. Henshall.

Genus CYPRINODON Lacépède.

64. Cyprinodon variegatus Lac. MUMMICHOG; SHEEPSHEAD KILLIFISH.

Atlantic coast of the United States from Cape Cod to Florida.

The male of this species may readily be distinguished by its deeper body and the black bar near the margin of the caudal.

13987. Noank, Connecticut, 1874. U. S. Fish Commission.

Genus FUNDULUS Lacépède.

Subgenus FUNDULUS Lacépède.

65. Fundulus diaphanus (Le Sueur) Agassiz. SPRING MINNOW; BARRED KILLIFISH.

Tributaries of the Great Lakes; Upper Mississippi Valley, west to Colorado; ponds and streams of the Eastern and Middle States.

30232. Cherrystone, Virginia, January 18, 1882. Col. M. McDonald.

Subgenus HYDRARGYRA Lacépède.

66. Fundulus similis (B. & G.) Günther.

Atlantic coast of the United States from South Carolina to Florida; Gulf of Mexico.

30780. Pensacola, Florida. Jordan & Stearns.

Subgenus XENISMA Jordan.

67. Fundulus stellifer Jordan. SPOTTED STUD-FISH.

Alabama River, in clear streams and springs (Jordan & Gilbert).

31070. Cave Spring, Georgia. Jordan & Brayton.

Genus ZYGONECTES Agassiz.

68. Zygonectes notatus (Raf.) Jordan. TOP MINNOW.

Michigan, and southward through the Mississippi Valley to Alabama and Texas. Abundant in ponds and canals (Jordan & Gilbert).

32259. Grenada, Mississippi. O. P. Hay.

Genus LUCANIA Girard.

69. Lucania venusta Girard.

Limia venusta GIRARD, U. S. & Mex. Bound. Surv. Ichth., 1859, p. 71.

Gulf of Mexico; abundant at Pensacola.

This small species is quite readily distinguished from *L. parva* by its larger dorsal and different proportions.

30819. Pensacola, Florida. Jordan & Stearns.

Genus GAMBUSIA Poey.

70. Gambusia patruelis (B. & G.) Girard. TOP MINNOW.

Heterandria patruelis B. & G., Proc. Acad. Nat. Sci. Phila. 1853, p. 390.

Southern United States, from Virginia to Texas; southward to Mexico, abounding in lowland streams.

Females distended with young were obtained by Colonel McDonald in August, 1881.

29109. Cherrystone, Virginia. Col. M. McDonald.

Genus MOLLIENESIA Le Sueur.

71. Mollienesia latipinna Le Sueur.

Southern United States bordering on the Gulf of Mexico; southward to Mexico; abundant in lowland streams.

18061. Lake Monroe, Florida. Prof. S. F. Baird.

Genus GIRARDINUS Poey.

72. Girardinus formosus Girard.

South Carolina to Florida, in streams.

The maximum size of this fish is said to be one inch.

23506. Saint John's River, Florida. G. Brown Goode.

CHARACINIDÆ.

Genus TETRAGONOPTERUS Cuvier.

73. Tetragonopterus argentatus (B. & G.) Jor. & Gilb.

Astyanax argentatus B. & G., Proc. Acad. Nat. Sci. Phila., 1854, p. 27.

Lower Mississippi Valley, from Arkansas southward and extending into Mexico.

This is the only *Characinid* in the United States.

869. (Two of the types of the species.) Rio Nueces, Texas. Col. J. D. Graham.

PERCOPSIDÆ.

Genus PERCOPSIS Agassiz.

74. Percopsis guttatus Agassiz. TROUT-PERCH.

The middle United States southward to the Potomac River, westward to Kansas, and northward at least to the Hudson Bay region; Great Lakes.

The trout-perch spawns in spring; it is frequently mistaken for a young salmon; its maximum length appears to be about 6 inches.

10452. Lapointe, Lake Superior. J. W. Milner.

SALMONIDÆ.

Genus OSMERUS Linné.

75. Osmerus mordax (Mitch.) Gill. SMELT; FROST-FISH.

Atlantic coast of North America from Nova Scotia to Cape Hatteras, entering streams; land-locked in many lakes, especially in New England, and running into nearly intangible varieties.

This is a food-fish of great excellence; the largest individuals we have seen were from lakes in Maine, their length being more than one foot.

32565. Lake Champlain, March, 1873. M. C. Edmunds.

15180. New Brunswick, New Jersey, 1875. J. R. Shotwell.

Genus HYPOMESUS Gill.

76. Hypomesus olidus (Pallas) Gill. POND SMELT.

Osmerus oligodon KNER, Denkschr. Kais. Akad. Wiss. Wien., xxiv, 1865, p. 9, taf. iv, fig. 1.

Northern Alaska; Eastern Siberia; Kamtchatka.

This seems to be the smallest of the smelts and is the least known; it has not been found at Saint Michael's since Mr. Turner obtained it in May 1877.

23973. (R.) Saint Michael's, Alaska (in ponds). L. M. Turner.

Genus THALEICHTHYS Girard.

77. Thaleichthys pacificus (Rich.) Girard. EULACHON; CANDLE-FISH.

Pacific coast of North America from Oregon northward to the Gulf of Alaska, in which it extends westward to Katmai on the peninsula of Aliaska; ascending streams in spring in immense schools.

This is an excellent food-fish; the manufacture of eulachon oil is becoming an important industry, though, as yet, little developed.

27297. Frazer's River, British Columbia. Jordan & Gilbert.

Genus THYMALLUS Cuvier.

78. Thymallus tricolor Cope. MICHIGAN GRAYLING; MONTANA GRAYLING.

Thymallus montanus MILNER, Rept. U. S. Comm. Fish., for 1872–1873 (1874), p. 741.

Streams of the southern peninsula of Michigan and thence westward to the headwaters of the Missouri.

11087. Au Sable River, Michigan. J. W. Milner.

Genus COREGONUS Linné.

Subgenus PROSOPIUM Milner.

79. Coregonus williamsonii Girard. ROCKY MOUNTAIN WHITE-FISH; CHIEF MOUNTAIN WHITE-FISH.

Coregonus couesii MILNER, Rept. U. S. Comm. Fish. for 1872–1873 (1874), p. 88.

Clear streams and lakes from the Rocky Mountains to the Pacific, northward to Oregon; found also in tributaries of the Saskatchawan and of the upper Missouri.

This is an abundant and valuable food-fish.

30305. Garrison Creek, Washington Territory, May 9, 1881. Capt. Chas. Bendire, U. S. A.

Subgenus COREGONUS Linné.

80. Coregonus clupeiformis (Mitch.) Milner. COMMON WHITE-FISH.

Great Lakes northwestward to the Yukon River in Alaska, where it reaches a weight of at least 20 pounds.

This is the most important of all the white-fishes; it has been extensively reared by artificial methods and distributed as widely as New Zealand.

10568. Lake Champlain (Alburgh Springs), 1872. R. Marfil.

Subgenus ARGYROSOMUS Agassiz.

81. Coregonus artedi Le Sueur. LAKE HERRING; CISCO; MICHIGAN HERRING.

Great Lakes northeastward to Labrador; represented in small lakes of Indiana and Wisconsin by the variety *cisco* of Jordan.

This species has considerable commercial importance.

17009. Lake Champlain. M. E. Hall.

Genus SALMO Linné.

82. Salmo salar L. subsp. **sebago** Girard. SEBAGO SALMON; LAND-LOCKED SALMON.

Saint Croix River and Sebago Lake; introduced into other lakes of New England and New York, also into streams as far south as North Carolina.

This is a beautiful game fish, highly esteemed by anglers and receiving considerable attention to its artificial propagation and distribution from the United States Fish Commission.

10543. Grand Lake, Maine. Senator M. C. Edmunds.

Genus ONCORHYNCHUS Suckley.

83. Oncorhynchus kisutch (Walb.) Jor. & Gilb. SILVER SALMON; KISUTCH; SKOWITZ; HOOPID SALMON; COHO SALMON; BIELAYA RIBA (Russian).

Pacific coast of North America from San Francisco northward to Bering Strait; Bering Island (Stejneger).

This is one of the smallest of the *Oncorhynchi*, reaching a length of only two feet and seldom exceeding 10 pounds in weight. It ascends streams a short distance in the fall.

At Unalashka I found it past the breeding season on the 8th of October, 1880.

21921. Neah Bay, Washington Territory, September 14, 1878. J. G. Swan.

Genus SALVELINUS Richardson.

84. Salvelinus fontinalis (Mitch.) Gill & Jor. BROOK TROUT; SPECKLED TROUT.

Rivers and lakes of British North America northward to the Arctic Circle; United States westward to Dakota and southward to North Carolina, principally east of the Alleghanies.

This is a very abundant, widely distributed, and beautiful game fish; the object of much care on the part of State fish commissions and fish culturists for its preservation and multiplication. Like its relative *S. malma* of the west, it grows largest in cold northern waters.

16098. Luzerne County, Pennsylvania. Dr. L. H. Taylor.
20950. Ridgewood, Long Island. E. G. Blackford.

HYODONTIDÆ.

Genus HYODON Le Sueur.

85. Hyodon alosoides (Raf.) Jor. & Gilb. MOON-EYE.

Hyodon chrysopsis RICH., F. B.—A., III, 1836, p. 232.

Upper Mississippi Valley northward to the Saskatchawan.

8443. Red River of the North. R. Kennicott.

CLUPEIDÆ.

Genus CLUPEA Linné.

Subgenus MELETTA Valenciennes.

86. Clupea vernalis Mitchill. ALEWIFE; BRANCH HERRING; GASPEREAU.

Atlantic coast of North America from Newfoundland to Florida, ascending far up the streams; land-locked in Cayuga, Seneca, and other lakes of Western New York; Lake Ontario (probably introduced with shad), and now appearing in myriads in the Upper Saint Lawrence River.

This is a food-fish of great importance. It is distinguished from the Glut Alewife or Herring by its higher fins, pale peritoneum, and larger eye.

32562. (Two spec.) North Carolina, March 23, 1883. Dr. T. H. Bean.

87. Clupea mediocris Mitchill. HICKORY SHAD; TAILOR HERRING; FALL HERRING; MATTOWACCA; SEA SHAD; SHAD.

Atlantic coast of North America from Newfoundland to Florida, entering streams.

This is a comparatively poor fish, yet it is largely sold by unprincipled persons as the true shad, which it approaches in size, though by no means in quality; it reaches a length of 16 inches.

32561. Potomac River, March 23, 1883. Dr. T. H. Bean.

Subgenus ALOSA Cuvier.

88. Clupea sapidissima Wilson. SHAD.

Atlantic coast of North America from Newfoundland to Florida, ascending rivers to spawn, many adults dying after the reproductive act; Gulf of Mexico, ascending rivers of the Mississippi Valley (since its introduction by the U. S. Fish Commission); Pacific coast of the United States from California to Oregon (introduced from the East), now so abundant that the young scarcely more than 6 inches long are offered for sale in the markets of San Francisco.

This is one of the most important of our fresh-water food-fishes.

32563. North Carolina, March 23, 1883. Dr. T. H. Bean.

DOROSOMATIDÆ.

Genus DOROSOMA Rafinesque.

89. Dorosoma cepedianum (Le S.) Gill. MUD SHAD; GIZZARD SHAD; HICKORY SHAD; WINTER SHAD.

Atlantic coast of the United States from Cape Cod to Florida, entering all streams and frequently landlocked in ponds. The western variety *D. heterurum* occurs throughout the Mississippi Valley, and has been introduced into the Great Lakes.

The species is scarcely fit for food, and yet it is sold rather freely in Washington markets.

20928. James River, Virginia, June 28, 1877. Dr. T. H. Bean.

CATOSTOMIDÆ.

Genus ICTIOBUS Rafinesque.

Subgenus ICTIOBUS Rafinesque.

90. Ictiobus bubalus (Raf.) Agassiz. RED-MOUTH BUFFALO-FISH.

Mississippi Valley; generally abundant in the larger streams (Jordan & Gilbert).

This is a species which attains to a very large size—3 feet in length—and sometimes weighs as much as 30 pounds.

8676. Mississippi Valley, United States.

91. Bubalichthys urus Agassiz. BIG-MOUTHED BUFFALO; BUFFALO CARP.

Mississippi Valley, in the larger streams (Jordan & Gilbert).

This species, also, reaches a large size; an individual from Madison, Indiana, which has been identified with it weighed 49 pounds; a cast of this fish is shown.

24741. Montgomery, Alabama, February, 1880. Col. M. McDonald.

Subgenus CARPIODES Rafinesque.

92. Carpiodes cyprinus (Le S.) Agassiz. LONG-FINNED CHUB SUCKER; SILVER CARP SUCKER; AMERICAN CARP.

Eastern United States from New York to Alabama, east of the Alleghanies.

This is a handsome and readily salable fish, although its quality is inferior.

32552. Havre de Grace, Maryland, June 9, 1882. Dr. T. H. Bean.

Genus CYCLEPTUS Rafinesque.

93. Cycleptus elongatus (Le Sueur) Agassiz. BLACK-HORSE; GOURD-SEED SUCKER; MISSOURI SUCKER; SUCKEREL.

Alleghany River (Cope); Mississippi Valley.

The Black Horse reaches a length of 30 inches; it is one of the most interesting of all the suckers, and is rare in most collections.

8673. Ohio River.

Genus PANTOSTEUS Cope.

94. Pantosteus platyrhynchus Cope.

Minomus platyrhynchus COPE, Proc. Amer. Philos. Soc. Phila., 1874, p. 134.

Utah Lake.

Jordan & Gilbert think this species doubtfully distinct from *Catostomus generosus* Girard.

30807. Utah Lake, Utah, June, 1882. Peter Madsen.

Genus CATOSTOMUS Le Sueur.

Subgenus CATOSTOMUS Le Sueur.

95. Catostomus tahoensis Gill & Jordan. LAKE TAHOE SUCKER.

Known as yet from Tahoe Lake only.

This is a sucker of large size and great abundance.

17109. Lake Tahoe, California. H. W. Henshaw.

Subgenus DECACTYLUS Rafinesque.

96. Catostomus commersonii (Lac.) Jordan. COMMON SUCKER; WHITE SUCKER; BROOK SUCKER; FINE-SCALED SUCKER.

All streams from Labrador to Florida and westward to the Rocky Mountains.

This is not a good fish, and yet it is sold in large quantities; it grows to 18 inches in length, the average size in Washington market being about one foot.

20344. Potomac River, April 13, 1876. Goode & Bean.

Subgenus HYPENTELIUM Rafinesque.

97. Catostomus nigricans Le Sueur. HOG SUCKER; STONE ROLLER; STONE LUGGER; BANDED SUCKER; MUD SUCKER.

United States from New York to Florida and westward to Alabama and Kansas; Great Lake region.

The species is said to reach a length of 2 feet; it has no value as food.

10563. Ecorse, Michigan. J. W. Milner.

Genus CHASMISTES Jordan.

98. Chasmistes liorus Jordan. JUNE SUCKER of Utah Lake.

Not yet known from any other waters than that named.

This is an interesting Sucker of large size, reaching 18 inches in length, and it is abundant in Utah Lake.

28399. Utah Lake, Utah, June 1881. Peter Madsen.

Genus ERIMYZON Jordan.

99. Erimyzon sucetta (Lac.) Jordan. CHUB SUCKER; CREEK; FISH; COMMON MULLET; HORNED SUCKER.

United States from New England to Texas, west to the Rocky Mountains.

A variable species of comparatively small size and little value.

21701. Potomac River. December 3, 1878. C. W. Schuermann.

Genus MINYTREMA Jordan.

100. Minytrema melanops (Raf.) Jordan. SPOTTED MULLET-STRIPED SUCKER.

Great Lake region; Mississippi Valley southward to Texas; Eastern United States to South Carolina.

A large sucker reaching 18 inches in length and sold in great numbers, though of inferior quality.

8434. Mississippi Valley.

Genus MOXOSTOMA Rafinesque.

101. Moxostoma macrolepidotum (Le Sueur.) Jordan. COMMON RED HORSE; MULLET; WHITE SUCKER; LARGE-SCALED SUCKER; STRIPED SUCKER; LAKE MULLET.

Great Lakes; Eastern United States from Vermont to South Carolina.

The species grows very large, reaching nearly 2 feet in length; it is sold in considerable quantities in the markets of Philadelphia and Washington; but is not seen in Baltimore according to Uhler and Lugger.

7995. Eastern United States.

102. Moxostoma duquesnii (Le Sueur) Jordan. WESTERN RED HORSE.

Ohio and Mississippi Valleys and southwestward to Arizona.

This may be only a variety of the last, as suggested by Jordan & Gilbert; it has, however, a much larger mouth and a longer head, so that it may readily be distinguished; it is exceedingly abundant, like the last, and is extensively used for food.

8025. Yellow Creek, Ohio. Prof. S. F. Baird.

CYPRINIDÆ.

Genus CAMPOSTOMA Agassiz.

103. Campostoma anomalum (Raf.) Agassiz. STONE-ROLLER; STONE-LUGGER; STEELY-BACK MINNOW.

Eastern United States from New York southward to North Carolina; Ohio and Mississippi Valleys southward to Texas, and west to Dakota; Mexico.

This is the most singular and interesting of our *Cyprinidæ*, having the air-bladder surrounded by convolutions of the alimentary canal.

8484. Yellow Creek, Ohio. Prof. S. F. Baird.

Genus ACROCHILUS Agassiz.

104. Acrochilus alutaceus Agassiz & Pickering. HARD-MOUTH.

Columbia River and its tributaries.

This fish derives its name from the presence of a horny plate on each of the jaws; it reaches a length of 12 inches.

30297. John Day River, Oregon, August 5, 1881. Capt. Charles Bendire.

Genus ORTHODON Girard.

105. Orthodon microlepidotus (Ayres) Girard.

Rivers of California; Great Basin of Utah (Yarrow).

This species reaches a length of 12 inches.

27139. Sacramento River, California, 1880. Jordan & Gilbert.

Genus LAVINIA Girard.

106. Lavinia exilicauda Baird & Girard.

Rivers of California.

This is equal in size to the last.

19608. California. L. Stone.

Genus CHROSOMUS Rafinesque.

107. Chrosomus erythrogaster Agassiz. RED-BELLIED DACE.

Eastern New York to Maryland, west to Dakota, and southward to Tennessee.

This is a small, but handsome species, particularly brilliant in spring.

9037. Yellow Creek, Ohio. Prof. S. F. Baird.

Genus ZOPHENDUM Jordan.

108. Zophendum siderium (Cope) Jordan.

Hyborhynchus siderius COPE, Zoöl. Wheeler's Expl. W. 100th Mer., v, p. 670, 1876.

Arizona.

16984. Camp Lowell, Arizona, September, 1874. J. M. Rutter.

Genus HYBOGNATHUS Agassiz.

109. Hybognathus regius Girard. SMELT; SMELT MINNOW.

New Jersey to Maryland and Virginia.

This species is abundant in the Potomac River, and is sometimes sold in early spring as "smelt," to which it bears almost no resemblance except in size and color. The spawning season begins in March or April.

7670. Eastern United States.

110. Hybognathus nuchalis Agassiz. SILVERY MINNOW.

New Jersey, Ohio and Mississippi Valleys and southwestward to New Mexico.

Perhaps identical with the last, as stated by Jordan & Gilbert.

10783. Trenton, New Jersey. C. C. Abbott.

Genus PIMEPHALES Rafinesque.

111. Pimephales promelas Raf. FAT-HEAD; BLACK-HEAD MINNOW.

Ohio Valley westward to the Upper Missouri.

7517. Lake Beaver, Petersburg. Prof. S. F. Baird.

Genus HYBORHYNCHUS Agassiz.

112. Hyborhynchus notatus (Raf.) Agassiz. BLUNT-NOSED MINNOW.

From New York westward to Wisconsin, thence southward to Arkansas; its distribution in the Eastern States imperfectly known.

8682. Yellow Creek, Ohio. Prof. S. F. Baird.

Genus EXOGLOSSUM Rafinesque.

113. Exoglossum maxillingua (Le Sueur) Haldeman. CUT-LIPS; STONE-TOTER; CHUB; NIGGER CHUB; BUTTER CHUB.

Western New York; the Susquehanna Basin in Pennsylvania (Cope); southward to Virginia.

20404. North Branch of Susquehanna River, Pennsylvania, June 3, 1875. Dr. L. H. Taylor.

Genus COCHLOGNATHUS Baird & Girard.

114. Cochlognathus ornatus Baird & Girard. HARD-MOUTH MINNOW.

Texas.

150. (R.) (One of the types of the species), Brownsville, Texas. Van Vliet.

Genus HEMITREMIA Cope.

Subgenus CHRIOPE Jordan.

115. Hemitremia maculata Hay.

Rivers in Mississippi (Hay).

32245. Jackson, Mississippi. O. P. Hay.

Genus CLIOLA Girard.

Subgenus HYBOPSIS Cope.

116. Cliola taurocephala (HAY) Jor. & Gilb. BULL-HEAD MINNOW.

Alburnops taurocephalus HAY, Proc. U. S. N. M., 1880, p. 503.

Rivers in Mississippi (Hay).

32309. Jackson, Mississippi. O. P. Hay.

Subgenus CLIOLA Girard.

117. Cliola chlora Jordan.

Upper Missouri region (Jordan & Gilbert).

20193. Northern Boundary Survey. E. Coues.

Subgenus HUDSONIUS Girard.

118. Cliola storeriana (Kirt.) Jor. & Gilb.

Great Lake region; said to include *Hudsonius amarus* Girard, and to extend southeastward to South Carolina.

11158. Sandusky, Ohio. J. W. Milner.

Subgenus CODOMA Girard.

119. Cliola iris (Cope) Jor. & Gilb.

Hypsilepis iris COPE, Expl. W. 100th, Mer. v, 1876, p. 653.

Upper Rio Grande River, New Mexico.

16977. Pools of Rio Grande River, San Ildefonso, New Mexico. Cope & Yarrow.

120. Cliola callisema Jordan.

Episema callisema JORDAN, Ann. Lyc. Nat. Hist., N. Y., 1876, p. 363.
Codoma callisema JORDAN, Bull. No. 12, U. S. N. M., 1878, p. 52.

The species is not yet recorded from any other stream than that named below.

17864. Ocmulgee River, Georgia. Prof. D. S. Jordan.

Subgenus MONIANA Girard.

121. Cliola deliciosa (Grd.) Jor. & Gilb.

Moniana proserpina GIRARD, Proc. Acad. Nat. Sci., Phila., 1856, p. 200.

Streams of the Rio Grande region.

117. (One of the types of the species.) Devil's River, Texas. J. H. Clark.

Subgenus CYPRINELLA Girard.

122. Cliola calliura Jordan.

Cyprinella calliura JORDAN, Bull. U. S. Nat. Mus., No. 10, p. 61, 1877.

Rivers of Alabama and Louisiana (Jordan & Gilbert).

6865 (R.) (One of the types.) Black Warrior River. Professor Winchell.

Subgenus PHOTOGENIS Cope.

123. Cliola analostana (Grd.) Jor. & Gilb. SILVER-FIN.

Cyprinella analostana GIRARD, Proc. Acad. Nat. Sci., Phila., 1859, p. 38.

Central New York; Pennsylvania and southward to Virginia; Ohio and Mississippi Valleys.

7476. Yellow Creek, Ohio. Prof. S. F. Baird.

Subgenus EROGALA Jordan.

124. Cliola galactura (Cope) Jor. & Gilb. MILKY-TAILED SHINER.

Hypsilepis galacturus COPE, Proc. Acad. Nat. Sci., Phila., 1867, p. 160.

Cumberland River, Tennessee, to Savannah River (Jordan & Gilbert).

20049. Cumberland River, Tennessee. A. Winchell.

Genus MINNILUS Rafinesque.

Subgenus LUXILUS Raf.

125. Minnilus cornutus (Mitch.) Jor. & Gilb. SHINER; RED-FIN; DACE.

United States westward to the Rocky Mountains, excluding the South Atlantic States and Texas.

The Shiner is excessively abundant; it reaches a length of 8 inches and is used as bait.

20436. Susquehanna River, Wilkesbarre, Pennsylvania, June 3, 1875. Dr. L. H. Taylor.

Subgenus ALBURNOPS Girard.

126. Minnilus blennius (Grd.) Jor. & Gilb.

Alburnops blennius GIRARD, Proc. Acad. Nat. Sci., Phila., 1856, p. 194.

The species is not known elsewhere than in the river which furnished the types; it has not been recorded as taken recently.

67. (One of the 12 type specimens.) Arkansas River, near Fort Smith. Dr. Shumard.

Subgenus "EPISEMA" Cope & Jordan.

127. Minnilus timpanogensis (Cope) Jor. & Gilb.

Hybopsis timpanogensis COPE, Proc. Amer. Phil. Soc., Phila., 1874, 134; COPE & YARROW, Zoöl. Wheeler's Expl. W. 100th Mer., v, p. 654.

Streams in Utah.

The species is known only from young specimens, and may be a young *Squalius* (Jordan & Gilbert).

15769. Gunnison, Utah. Francis Klett.

Subgenus LYTHRURUS Jordan.

128. Minnilus diplæmius (Raf.) Hay. RED-FIN.

Semotilus diplæmius RAF., Ichth, Ohien.
Hypsilepis diplæmia COPE, Proc. Acad. Nat. Sci., Phila., 1867, p. 162.
Lythrurus diplæmius JORDAN, Man. Vert., ed. 2, p. 295.

Ohio Valley; Upper Mississippi Valley; Great Lake region.

8325. Black River. Prof. S. F. Baird.

Subgenus MINNILUS Raf.

129. Minnilus scepticus Jor. & Gilb.

Saluda River, South Carolina; not yet recorded from any other locality.

31081. (Two of the type specimens.) Saluda River, South Carolina. Jordan & Brayton.

Genus ERICYMBA Cope.

130. Ericymba buccata Cope. SILVER-MOUTHED DACE.

Western Pennsylvania; Ohio Valley; Mississippi Valley.

This appears to be a species of wide distribution; it is remarkable for the cavernous bones of its head.

7001. Yellow Creek, Ohio. Prof. S. F. Baird.
27421. Chickasawha River. O. P. Hay.

Genus PHENACOBIUS Cope.

131. Phenacobius catostomus Jordan.

Alabama River (Jordan & Gilbert); Etowah River.

31087. Etowah River. Jordan & Brayton.

Genus RHINICHTHYS Agassiz.

132. Rhinichthys atronasus (Mitch.) Agassiz. BLACK-NOSED DACE.

Eastern United States from New England to Virginia, and westward to Ohio.

15244. Susquehanna River, Bainbridge, Pennsylvania. Dr. T. H. Bean.

Genus APOCOPE Cope.

133. Apocope vulnerata Cope.

Utah southward to Arizona, and west to California and Oregon.

This is a variable species; it reaches a length of 4 inches or more.

30749. Utah Lake, Utah. Peter Madsen.

Genus CERATICHTHYS Baird.

134. Ceratichthys biguttatus (Kirt.) Girard. RED-SPOTTED CHUB; HORN CHUB; HORNY HEAD; STONY HEAD; RIVER CHUB; JERKER.

From Pennsylvania westward to the Great Basin of Utah; its distribution southward not definitely recorded; not found in the Delaware basin (Cope); Chattahoochee River (Jordan).

The horn chub takes its name from the tubercles extensively developed on the head of the adults in the breeding season; it reaches a length of 9 inches, and is used for food.

16969. Susquehanna River, Bainbridge, Pennsylvania. Dr. T. H. Bean.

Genus COUESIUS Jordan.

135. Couesius prosthemius (Cope) Jordan.

Ceratichthys prosthemius COPE, Cypr. Penn., 1866, p. 365.

Ceratichthys plumbeus GÜNTHER, Cat. Fish. Brit. Mus., vii, 1868, p. 442.

Upper Great Lakes.

The species is said to reach a length of 6 inches.

20332. Grand Island, Lake Superior. J. W. Milner.

Genus PLATYGOBIO Gill.

136. Platygobio gracilis (Rich.) Gill & Jordan. FLAT-HEADED CHUB.

Rocky Mountain region from the Kansas and Yellowstone Rivers to the Saskatchawan; abundant (Jordan & Gilbert).

Maximum length of specimens observed, 12 inches.

20300. Northern Pacific Railroad Survey. Dr. Suckley.

Genus SEMOTILUS Rafinesque.

Subgenus SEMOTILUS Rafinesque.

137. Semotilus corporalis (Mitch.) Putnam. CHUB; HORNED DACE; LITTLE FALL-FISH; CORPORAALEN.

United States from Massachusetts southward to Georgia and west to Missouri; not plentiful in Maryland (Uhler & Lugger), but elsewhere generally abundant.

It sometimes reaches 4 pounds in weight, and is a fair food-fish (Cope). The maximum length is said to be 12 inches.

9154. Wisconsin. Prof. S. F. Baird.

Genus POGONICHTHYS Girard.

138. Pogonichthys macrolepidotus (Ayres) Jordan. SPLIT-TAIL.

Pogonichthys inæquilobus B. & G., Proc. Acad. Nat. Sci., Phila., 1854, p. 136.

Rivers of California.

The split-tail is "singularly distinguished from our other *Cyprinidæ* by the great development of the upper lobe of the caudal and its rudimentary rays" (Jordan & Gilbert). Our largest examples are 12 inches long. The species is used for food.

12967. Mare Island, California. Dr. T. H. Streets.

Genus MYLOCHILUS Agassiz.

139. Mylochilus caurinus (Rich.) Girard. COLUMBIA CHUB.

Cyprinus (*Leuciscus*) *caurinus* RICH., F. B.—A., iii, 1836, p. 304.

Streams chiefly west of the Cascade range, from California to British Columbia, often entering the sea; abundant (Jordan & Gilbert).

This chub reaches a length of 12 inches; it is a food-fish.

27271. Puget Sound. Prof. D. S. Jordan.

Genus MYLOPHARODON Ayres.

140. Mylopharodon conocephalus (B. & G.) Girard.

Gila concephala B. & G., Proc. Acad. Nat. Sci., Phila., 1854, p. 134.
Mylopharodon robustus AYRES, Proc. Cal. Acad. Nat. Sci., 1855, p. 33.

Rivers of California.

This species grows very large, reaching 18 inches in length; it is used for food.

6185. (Poor specimen.) Chico Creek, California. J. S. Newberry.

Genus PTYCHOCHILUS Agassiz.

141. Ptychochilus oregonensis (Rich.) Girard. SACRAMENTO "PIKE"; "WHITEFISH."

Rivers of the Pacific slope, chiefly west of the Sierra Nevada (Jordan & Gilbert).

This fish is said to reach a length of 5 feet; it is used for food; in cold streams its flesh is excellent, as, for example, in the McCloud, where it sometimes weighs as much as 28 pounds.

32498. Port Townsend, Washington Territory. J. G. Swan.

Genus GILA Baird & Girard.

142. Gila robusta Baird & Girard.

Rio Colorado and Rio Gila and their tributaries.

The species reaches one foot in length.

15805. Zuñi, New Mexico. H. W. Henshaw.

Genus SQUALIUS Bonaparte.

Subgenus CLINOSTOMUS Girard.

143. Squalius elongatus (Kirt.) Jor. & Gilb. RED-SIDED SHINER; RED-SIDED MINNOW.

Luxilus elongatus Kirtland, Rept. Zoöl. Ohio, p. 169, and Boston Journ. Nat. Hist., iii, p. 339.
Gila elongata Jordan, Man. Vert. E. U. S., 1876, p. 285.

Western Pennsylvania; Ohio Valley; Great Lakes; Upper Mississippi Valley.

8727. Yellow Creek, Ohio. Prof. S. F. Baird.

Subgenus TIGOMA Girard.

144. Squalius alĭciæ Jouy.

Known at present from Utah Lake only, where it is abundant.

30805. Utah Lake, Utah. Peter Madsen.

Subgenus SIBOMA Girard.

145. Squalius gibbosus (Ayres) Jor. & Gilb. MULLET; CHUB.

Siboma crassicauda GIRARD, Proc. Acad. Nat. Sci., Phila., 1856, p. 208, and Pac. R. R. Surv., Fish, p. 296.

Lavinia gibbosa AYRES, Daily Placer Times & Transcript, Cal., May 30, 1854.

Rivers of California.

The species reaches 12 inches in length.

6729. San Joaquin, California. A. L. Heermann.

Subgenus SQUALIUS Bonap.

146. Squalius atrarius (Girard) Jor. & Gilb. UTAH MULLET; CHUB of Utah Lake.

Siboma atraria GIRARD, Proc. Acad. Nat. Sci., Phila., 1856, p. 208, and Pac. R. R. Surv., x, p. 297.

Utah Basin.

This species reaches a length of 20 inches; it is used as food and is very destructive to young trout.

15995. Denver, Colorado. H. W. Henshaw.

Subgenus CHEONDA Girard.

147. Squalius nigrescens (Grd.) Jor. & Gilb.

Tigoma nigrescens GIRARD, Proc. Acad. Nat. Sci., Phila., 1856, p. 207, and U. S. & Mex. Bound. Surv., Ichth., p. 64.

Boca Grande and Janos Rivers.

220. (R.) Boca Grande. Dr. C. B. Kennerly.

Genus PHOXINUS Agassiz.

148. Phoxinus phlegethontis (Cope) Jor. & Gilb.

Clinostomus phlegethontis COPE, Proc. Amer. Phil. Soc., Phila., 1874, p. 137.

Gila phlegethontis COPE, Zoöl. Wheeler's Expl. W. 100th Mer., v, p. 657.

Beaver River and Utah Lake.

30804. Utah Lake, Utah. Peter Madsen.

Genus MYLOLEUCUS Cope.

149. Myloleucus formosus (Girard) Jordan.

Algansea formosa GIRARD, Proc. Acad. Nat. Sci., Phila., 1856, p. 183.

Algansea bicolor GIRARD, Proc. Acad. Nat. Sci., Phila., 1856, p. 183 (*fide* Jordan & Gilbert).

Rivers of California.

197. (R.) (One of the type specimens.) Mohave River. Heermann.

Genus OPSOPŒODUS Hay.

150. Opsopœodus emiliæ Hay.

Mississippi (Hay).

The example in this collection was identified by Prof. Hay.

32222. Jackson, Mississippi. O. P. Hay.

Genus NOTEMIGONUS Rafinesque.

151. Notemigonus chrysoleucus (Mitch.) Jordan. GOLDEN SHINER; BREAM; ROACH.

United States, from New England west to Dakota; Mississippi Valley south to Texas; in the Eastern States south at least to Delaware.

The species grows to a length of 12 inches. According to Professor Cope it sometimes weighs 1½ pounds. It is used principally for bait.

20248. Riverhead, Long Island. Prof. S. F. Baird.

Genus RICHARDSONIUS Girard.

152. Richardsonius balteatus (Rich.) Girard. RED-SIDED BREAM.

Columbia River region and northward in British America.

27341. Frazer's River, British Columbia. Jordan & Gilbert.

Genus LEPIDOMEDA Cope.

153. Lepidomeda vittata Cope.

Colorado Chiquito River, Arizona (Cope).

15785. (Condition very bad, just as in all of our specimens of this species.) Colorado Chiquito River, Arizona. H. W. Henshaw.

Genus PLAGOPTERUS Cope.

154. Plagopterus argentissimus Cope.

San Luis Valley, Western Colorado (Cope); New Mexico.

15776. Colorado Chiquito River, New Mexico. C. G. Newberry.

Genus CYPRINUS Linné.

155. Cyprinus carpio Linné. CARP.

Temperate parts of Asia, in fresh water; introduced into Europe and North America; widely distributed in the United States by the U. S. Fish Commission.

The example shown was hatched at the U. S. Carp Ponds, Washington, in the spring of 1881, and taken out January 10, 1882; it is, therefore, less than one year old.

32556. U. S. Carp Ponds, Washington, D. C. U. S. Fish Commission.

Genus CARASSIUS Nilsson.

156. Carassius auratus (L.) Bleeker. GOLD-FISH.

Japan; China; introduced into Europe and the United States; "now naturalized in many of our eastern streams" (Jordan & Gilbert).

This species in the Hudson River is frequently and persistently mistaken for the preceding.

22107. U. S. Carp Ponds, Washington, D. C., January 24, 1878. Wm. Palmer.

Genus TINCA Cuvier.

157. Tinca vulgaris Cuv. TENCH.

Europe; introduced into the United States by the U. S. Fish Commission.

The individual exhibited escaped from the U. S. ponds at Washington into the Potomac River. Two of these fishes examined by me have the pharyngeal teeth with all traces of the hook worn off and with a long grinding surface—in remarkable contrast with European examples of like size.

31003 (R.) Potomac River, Washington, D. C., June 24, 1882. Dr. T. H. Bean.

Genus IDUS Heckel.

158. Idus melanotus Heckel. GOLDEN IDE; NERFLING; ALAND; ORFE.

Central and northern parts of continental Europe (Günther); introduced into the United States by the U. S. Fish Commission.

In the U. S. Carp Ponds examples 12 inches long have been obtained.

30673. U. S. Carp Ponds, Washington, D. C., May 29, 1882.

SILURIDÆ.

Genus NOTURUS Rafinesque.

Subgenus NOTURUS Rafinesque.

159. Noturus flavus Rafinesque. STONE-CAT; YELLOW STONE-CAT.

Saint Lawrence River to Virginia; westward to Nebraska, and southward to Texas.

This species reaches a length of 12 inches.

1472. Madrid, New York. E. A. Dayton.

Genus LEPTOPS Rafinesque.

160. Leptops olivaris (Raf.) Jor. & Gilb. MUD CAT; YELLOW CAT; BASHAW; GOUJON.

Ohio and Mississippi Valleys, in muddy waters.

The mud cat reaches a weight of 75 pounds (Jor. & Gilb.); it is much used as food.

1524. Cincinnati, Ohio. Prof. S. F. Baird.

Genus AMIURUS Rafinesque.

161. Amiurus catus (L.) Gill. BULL-HEAD; HORNED POUT; CAT-FISH; SMALL CAT-FISH; SCHUYLKILL CAT.

The Great Lakes; Ohio Valley; Eastern United States from Maine to South Carolina; introduced into California, where it has become very abundant.

This is one of the best known and most esteemed of our cat-fish. It reaches a length of 18 inches; in the markets of Philadelphia, Baltimore, and Washington it is extensively sold, sometimes with the skin removed.

32551. Havre de Grace, Maryland, June 9, 1882. Dr. T. H. Bean.

Genus ICTALURUS Rafinesque.

162. Ictalurus punctatus (Raf.) Jordan. CHANNEL CAT; WHITE CAT; BLUE CAT.

Eastern United States from Vermont to Georgia; Ohio and Mississippi Valleys; westward to Montana; southward to Texas and Mexico.

This is a valuable food-fish. It reaches a weight of 20 to 25 pounds and a length of 3 feet. "It has been described under some twenty-three different specific names" (Cope).

17804. Near Montgomery, Alabama, 1876. Dr. T. H. Bean.

ANGUILLIDÆ.

Genus ANGUILLA Thunberg.

163. Anguilla rostrata (Le Sueur) De Kay. COMMON EEL.

Atlantic coast of the United States from Maine to Florida, ascending streams; Gulf of Mexico and Mississippi Valley; southward to Mexico; introduced into the Great Lakes and into California.

This is an exceedingly abundant and rather valuable food-fish; it is, however, very destructive to the spawn of shad and other important species, often completely disemboweling fishes caught in gill-nets before they can be taken from the water.

10415. Wood's Holl, Massachusetts. Prof. S. F. Baird.

AMIIDÆ.

Genus AMIA Linné.

164. Amia calva Linné. MUD-FISH; DOG-FISH; BOW-FIN GRINDLE; "JOHN A. GRINDLE;" LAWYER.

Great Lakes; Ohio and Mississippi valleys, southward to Texas; Eastern United States from New York to North Carolina; once taken in the Susquehanna; not known from the Delaware nor any other Atlantic stream north of the Roanoke (Cope).

The male reaches 18 inches in length and has a black spot surrounded by a yellow or orange ring; the female reaches 2 feet or more and is without the caudal spot. The fish is of no value as food.

29817. Tributary of Cayuga Lake, New York, December 16, 1881. L. M. Miller.

LEPIDOSTEIDÆ.

Genus LEPIDOSTEUS Lacépède.

Subgenus CYLINDROSTEUS Rafinesque.

165. Lepidosteus platystomus Rafinesque. SHORT-NOSED GAR.

Great lakes; rivers of the Ohio and Mississippi Valleys, southward to the Rio Grande; Florida.

17799. Round Lake, near Montgomery, Alabama, July 14, 1876. Kumlien & Bean.

Subgenus ATRACTOSTEUS Rafinesque.

166. Litholepis spatula (Lac.). ALLIGATOR GAR.

Rivers of the Southern United States; Cuba; Mexico and Central America.

The species is reported to reach 12 feet in length; it is said to be an implacable foe of the alligator.

32311. Vicksburg, Mississippi, 1882. O. P. Hay.

POLYODONTIDÆ.

Genus POLYODON Lacépède.

167. Polyodon spathula (Walb.) Jor. & Gilb. PADDLE-FISH; SPOON-BILL CAT; DUCK-BILL CAT; SPOON-BILLED STURGEON.

Ohio and Mississippi Valleys, generally abundant.

This singular fish grows to a length of 6 feet; its food consists of minute crustacea which it strains from the mud passed through its gill-rakers (Forbes).

32387. (2 spec.) Illinois River, Illinois, 1882. Wm. McAdams.

ACIPENSERIDÆ.

Genus ACIPENSER Linné.

168. Acipenser rubicundus Le Sueur. LAKE STURGEON; OHIO STURGEON; BLACK STURGEON; STONE STURGEON; ROCK STURGEON; RED STURGEON.

Mississippi Valley; Great Lakes, and northward, usually not descending to the sea (Jordan & Gilbert).

This species is an important food-fish; it reaches a length of 6 feet and a weight of 100 pounds.

3270. Michipicotan, Lake Superior. G. Barnston.

Genus SCAPHIRHYNCHOPS Gill.

169. Scaphirhynchops platyrhynchus (Raf.) Gill. SHOVEL-NOSED STURGEON; WHITE STURGEON.

Ohio and Mississippi Valleys, westward to Montana and southward to Texas.

This species reaches a length of 5 feet.

3255. Cincinnati, Ohio. Prof. S. F. Baird.

TRYGONIDÆ.

Genus TRYGON Adanson.

170. Trygon sabina Le Sueur. STINGAREE; STING-RAY.

Florida.

This species is not uncommon in Lake Monroe, where Professor Baird found it April 2, 1877.

22818. Pensacola, Florida, 1878. Silas Stearns.

PETROMYZONTIDÆ.

Genus ENTOSPHENUS Gill.

171. Entosphenus tridentatus (Gairdner) Gill. THREE-TOOTHED LAMPREY.

Coast of California and northward, ascending streams.

The example shown is referred to in a paper by Bean, Proc. U. S. Nat. Mus., v, p. 93, June 12, 1882.

30295. Fort Walla Walla, Washington Territory. May 6, 1881. Capt. Chas. Bendire, U. S. A.

Genus AMMOCŒTES Duméril.

172. Ammocœtes niger (Raf.) Jordan. SMALL BLACK LAMPREY.

Great Lakes; Ohio Valley; Upper Mississippi Valley, ascending streams to deposit its eggs; abundant.

This is a small lamprey, seldom exceeding 10 inches in length and supposed to be identical with the European *A. branchialis*; this, however, is a mere suspicion and not based upon comparison of European with American examples.

12517. Waukegan, Illinois. J. W. Milner.

Genus PETROMYZON Linné.

173. Ichthyomyzon argenteus (Kirtland) Girard. SILVERY LAMPREY.

Great Lakes; Mississippi Valley; ascending small streams at the spawning season in spring.

This species reaches a length of 12 inches; it is properly a *Petromyzon*. In the specimens of this species and *I. castaneus* Grd. in the National Museum the difference in the number of mandibular teeth is constant.

7419. Louisville, Kentucky.

CATALOGUE OF CASTS AND PHOTOGRAPHS OF FISHES.

LOPHIIDÆ.

1. Lophius piscatorius Linné. GOOSE-FISH.

Photograph.

ORTHAGORISCIDÆ.

2. Mola rotunda Cuv. SUN-FISH.

Photograph.

DIODONTIDÆ.

3. Chilomycterus geometricus (L.) Kaup. BUR-FISH.

Cast.
Photograph.

TETRODONTIDÆ.

4. Tetrodon lævigatus (L.) Gill. RABBIT-FISH.

Cast.
Photograph.

OSTRACIIDÆ.

5. Ostracion quadricorne Linné. COW-FISH.

Cast.
Photograph.

BALISTIDÆ.

6. Balistes capriscus Gmelin. LEATHER-JACKET.

Cast.

7. Balistes vetula Linné. OLD WIFE.

Cast.
Photograph.

8. Alutera schœpffi (Walb.) Goode & Bean. ORANGE FILE-FISH.

Cast.
Photograph.

SYNGNATHIDÆ.

9. Siphostoma fuscum (Storer) Jor. & Gilb. PIPE-FISH.

Photograph.

SOLEIDÆ.

10. Achirus lineatus (L.) Cuv. AMERICAN SOLE.

Cast.
Photograph.

PLEURONECTIDÆ.

11. Limanda ferruginea (Storer) Goode & Bean. RUSTY FLOUNDER.

Cast.
Photograph.

12. Pleuronectes americanus Walb. FLATFISH; WINTER FLOUNDER.

Photograph.

13. Pleuronectes stellatus Pall. STELLATE FLOUNDER.

Cast.
Photograph.

14. Lepidopsetta bilineata (Ayres) Gill.

Photograph.

15. Glyptocephalus cynoglossus (L.) Gill. POLE FLOUNDER.

Cast.
Photograph.

16. Bothus maculatus (Mitch.) Jor. & Gilb. WINDOW-PANE; SAND FLOUNDER.

Cast.
Photograph.

17. Hippoglossoides platessoides (Fabr.) Gill. SAND DAB.

Cast.

18. Paralichthys dentatus (L.) Jor. & Gilb. COMMON FLOUNDER.

Cast.
Photograph.

19. Paralichthys oblongus (Mitch.) Jor. & Gilb. FOUR-SPOTTED FLOUNDER.

Cast.
Photograph.

20. Psettichthys melanosticutus Girard. CALIFORNIA SPOTTED SOLE.

Photograph.

21. Hippoglossus vulgaris Fleming. HALIBUT.

Cast of young.
Cast of adult.
Photograph.

22. Platysomatichthys hippoglossoides (Walb.) Goode & Bean. TURBOT.

Cast.

GADIDÆ.

23. Pollachius carbonarius (L.) Bon. POLLACK.

Photograph.

24. Gadus morrhua Linné. COD-FISH.

Photograph.

25. Microgadus tomcodus (Walb.) Gill. TOM COD.

Photograph.

26. Melanogrammus æglefinus (L.) Gill. HADDOCK.

Photograph.

27. Phycis tenuis (Mitch.) DeKay. SQUIRREL HAKE.

Photograph.

28. Brosmius brosme (Müller) White. CUSK.

Photograph.

29. Lota maculosa (Les.) Rich. BURBOT.

Photograph.

MERLUCIIDÆ.

30. Merlucius bilinearis (Mitch.) Gill. WHITING.

Photograph.

AMMODYTIDÆ.

31. Ammodytes americanus DeKay. SAND LAUNCE.

Photograph.

XIPHISTERIDÆ.

32. Murænoides gunellus (L.) Goode & Bean. ROCK-EEL.

Photograph.

ANARRHICHADIDÆ.

33. Anarrhichas minor Olafsen. LEOPARD WOLF-FISH.

Photograph.

BATRACHIDÆ.

34. Batrachus pardus Goode & Bean. SARPO.

Cast.

CYCLOPTERIDÆ.

35. Cyclopterus lumpus Linné. LUMP-FISH.

Photograph.

TRIGLIDÆ.

36. Prionotus carolinus (L.) Cuv. & Val. SEA ROBIN.

Photograph.

37. Prionotus evolans (L.) Gill. STRIPED SEA ROBIN.

Photograph.

COTTIDÆ.

38. Cottus octodecimspinosus Mitch. 18-SPINED SCULPIN.

Photograph.

39. Cottus grœnlandicus Cuv. & Val. GREENLAND SCULPIN.

Photograph.

40. Cottus æneus Mitchill. PIGMY SCULPIN.

Photograph.

HEMITRIPTERIDÆ.

41. Hemitripterus americanus (Gmel.) Cuvier. SEA RAVEN.

Photograph.

SCORPÆNIDÆ.

42. Sebastes marinus (L.) Lütken. NORWAY HADDOCK.

Photograph.

43. Sebastichthys rosaceus (Girard) Jor. & Gilb. CORSAIR.

Photograph.

CHIRIDÆ.

44. Hexagrammus decagrammus (Pall.) Jor. & Gilb. ROCK TROUT.

Photograph.

LABRIDÆ.

45. Tautoga onitis (L.) Günther. TAUTOG.

Cast.
Photograph.

46. Ctenolabrus adspersus (Walb.) Goode. CUNNER.

Photograph.

EMBIOTOCIDÆ.

47. Ditrema laterale (Ag.) Gthr. BLUE PERCH.

Photograph.

XIPHIIDÆ.

48. Histiophorus americanus Cuv. & Val. SAIL-FISH.

Photograph.

TRICHIURIDÆ.

49. Trichiurus lepturus Linné. SCABBARD-FISH.

Cast.
Photograph.

SCOMBRIDÆ.

50. Scomber scombrus Linné. MACKEREL.

Cast.
Photograph.

51. Sarda mediterranea (Bl. Schn.) Jor. & Gilb. BONITO.

Cast.
Photograph.

52. Orcynus thynnus (L.) Goode. HORSE MACKEREL.

Cast.
Photograph.

53. Orcynus alliteratus (Raf.) Gill. ALBICORE.

Cast.
Photograph.

54. Orcynus pelamys (L.) Poey. OCEANIC BONITO.

Cast.

55. Scomberomorus maculatus (Mitch.) Jor. & Gilb. SPANISH MACKEREL.

Cast.
Photograph.

56. Scomberomorus regalis (Bloch) Jor. & Gilb. SPOTTED CERO.

Cast.
Photograph.

57. Scomberomorus caballa (C. & V.) Jor. & Gilb. SIERRA; CERO.

Cast.
Photograph.

CARANGIDÆ.

58. Selene argentea (Lac.) Brevoort. MOON-FISH.

Cast.

59. Argyreiosus vomer Lac. SILVER FISH.

Cast.
Photograph.

60. Caranx crumenophthalmus (Bloch) Lac. BIG-EYED SCAD.

Cast.
Photograph.

61. Caranx pisquetus C. & V. CREVALLÉ.

Photograph.

62. Caranx hippus (L.) Günther. HORSE CREVALLÉ.

Cast.
Photograph.

63. Caranx chrysus Mitch. YELLOW MACKEREL.

Photograph.

64. Blepharis crinitus (Akerly) DeKay. THREAD-FISH.

Photograph.

65. Trachynotus carolinus (L.) Gill. POMPANO.

Cast.

66. Trachynotus ovatus (L.) Gthr. ROUND POMPANO.

Photograph.

67. Trachynotus goreënsis Cuv. & Val. AFRICAN POMPANO.

Cast.

68. Seriola zonata (Mitch.) Cuv. & Val. BANDED RUDDER-FISH.

Cast.
Photograph.

69. Seriola carolinensis Holbrook.

Cast.

70. Seriola lalandii C. & V. AMBER-FISH.

Photograph.

71. Oligoplites saurus (Bl. Schn.) Jor. & Gilb. LEATHER-JACKET.

Cast.
Photograph.

CORYPHÆNIDÆ.

72. Coryphæna hippurus Linné. GREAT DOLPHIN.

Cast.
Photograph.

STROMATEIDÆ.

73. Stromateus triacanthus Peck. HARVEST-FISH.

Photograph.

74. Stromateus paru Linné. SHORT HARVEST-FISH.

Cast.

SCIÆNIDÆ.

75. Cynoscion regalis (Bl.) Gill. WEAK-FISH; SQUETEAGUE.

Photograph.

76. Cynoscion maculatum (Mitch.) Gill. SPOTTED SEA TROUT.

Photograph.

77. Pogonias chromis Lac. DRUM.

Photograph.

78. Haploidonotus grunnieus Raf. FRESH-WATER DRUM.

Photograph.

79. Liostomus obliquus (Mitch.) DeKay. SPOT.

(Not different from the next.)

Photograph.

80. Liostomus xanthurus Lac. YELLOW-TAILED SPOT.

Photograph.

81. Sciæna chrysura (Lac.) Jor. & Gilb. SILVER-FISH; YELLOW-TAIL.

Photograph.

82. Sciæna ocellata (L.) Gthr. CHANNEL BASS.

Photograph.

83. Menticirrus alburnus (L.) Gill. SOUTHERN KING-FISH.

Photograph.

84. Menticirrus nebulosus (Mitch.) Gill. KING-FISH.

Photograph.

85. Micropogon undulatus (L.) Cuv. & Val. CROAKER.

Photograph.

SPARIDÆ.

86. Diplodus probatocephalus (Walb.) Jor. & Gilb. SHEEP'S HEAD.

Photograph.

87. Stenotomus versicolor (Mitch.) Bean. SCUPPAUG.

Photograph.

PRISTIPOMATIDÆ.

88. Lutjanus blackfordii Goode & Bean. RED SNAPPER.

Photograph.

89. Anisotremus virginicus (L.) Gill.

Photograph.

90. Ocyurus chrysurus (Bl.) Gill. GOLDEN-TAIL.

Photograph.

CENTRARCHIDÆ.

91. Centrarchus macropterus (Lac.) Jor.

Cast.

92. Pomoxys sparoides (Lac.) Girard. GRASS BASS.

Photograph.

93. Ambloplites rupestris (Raf.) Gill. ROCK BASS.

Cast.

94. Lepomis auritus (L.) Raf. LONG-EARED SUN-FISH.

Cast.

95. Lepomis gibbosus (L.) McKay. COMMON SUN-FISH.

Cast.
Photograph.

96. Micropterus dolomiei Lac. SMALL-MOUTHED BLACK BASS.

Cast.

97. Micropterus salmoides (Lac.) Henshall. LARGE-MOUTHED BLACK BASS.

Cast.
Photograph.

SERRANIDÆ.

98. Epinephelus drummond-hayi Goode & Bean. JOHN PAW; SPOTTED HIND.

Cast.

99. Epinephelus morio (Cuv.) Gill. RED-BELLIED SNAPPER.

Cast.
Photograph.

99 b. Epinephelus guasa (Poey) Jor. & Gilb. GUASA.

Cast.

100. Mycteroperca falcata (Poey) Jor. & Gilb. SCAMP.

Cast.

101. Serranus atrarius (L.) Jor. & Gilb. SEA BASS.

Cast of male.
Cast of female.
Photograph.

102. Diplectrum fasciculare (Cuv. & Val.) Holb. SQUIRREL.

Cast.
Photopraph.

PERCIDÆ.

103. Perca americana Schranck. YELLOW PERCH.

Cast.
Photograph.

104. Stizostedium vitreum (Mitch.) Jordan & Copeland. YELLOW PIKE PERCH.

Cast.
Photograph.

105. Stizostedium canadense (Smith) Jordan. CANADA PIKE PERCH.

Cast.
Photograph.

LABRACIDÆ.

106. Roccus saxatilis (Bl. Schn.) Jor. & Gilb. STRIPED BASS.

Cast.
Photograph.

107. Roccus chrysops (Raf.) Gill. WHITE BASS.

Cast.
Photograph.

108. Roccus americanus (Gmel.) Jor. & Gilb. WHITE PERCH.

Cast.
Photograph.

109. Roccus interruptus (Gill) Jor. & Gilb. YELLOW BASS.

Cast.

EPHIPPIIDÆ.

110. Chætodipterus faber (Brouss.) Jor. & Gilb. MOON FISH.

Cast.
Photograph.

LOBOTIDÆ.

111. Lobotes surinamensis Cuv. FLASHER.

Cast.
Photograph.

POMATOMIDÆ.

112. Pomatomus saltatrix (L.) Gill. BLUE-FISH.

Cast.

ELACATIDÆ.

113. Elacate canada (L.) Gill. COBIA; CRAB-EATER.

Cast.
Photograph.

PRIACANTHIDÆ.

114. Priacanthus altus Gill.

Photograph.

ECHENEIDIDÆ.

115. Echeneis naucrates Linné. REMORA; SUCKER-FISH.

Photograph.

116. Rhombochirus osteochir (Cuv.) Gill. SPEAR-FISH SUCKER.

Photograph.

SPHYRÆNIDÆ.

117. Sphyræna borealis DeKay. BARRACUDA.

Photograph.

MUGILIDÆ.

118. Mugil albula Linné. STRIPED MULLET.

Photograph.

ATHERINIDÆ.

119. Menidia notata (Mitch.) Jor. & Gilb. SILVERSIDE.

Photograph.

GASTEROSTEIDÆ.

120. Gasterosteus pungitius Linné. 10-SPINED STICKLE-BACK.

Photograph.

BELONIDÆ.

121. Tylosurus marinus (Bl. Schn.) Jor. & Gilb. SILVER GAR-FISH.

Photograph.

ESOCIDÆ.

122. Esox americanus Gmelin. BROOK PICKEREL.

Photograph.

123. Esox reticulatus Le Sueur. PICKEREL.

Cast.

124. Esox lucius Linné. PIKE.

Cast.
Photograph.

125. Esox nobilior Thompson. MUSKELLUNGE.

Cast.
Photograph.

CYPRINODONTIDÆ.

126. Fundulus majalis (Walb.) Gthr. MAYFISH.

Photograph.

SALMONIDÆ.

127. Osmerus mordax (Mitch.) Gill. SMELT.

Cast.
Photograph.

128. Coregonus clupeiformis (Mitch.) Milner. WHITE-FISH.

Casts (2).
Photograph.

129. Coregonus quadrilateralis Rich. ROUND WHITE-FISH; SHAD-WAITER.

Cast.
Photograph.

130. Coregonus artedi LeS. LAKE HERRING.

Photograph.

131. Thymallus tricolor Cope. GRAYLING.

Cast of male.
Cast of female.
Photograph.

132. Salmo salar Linné. ATLANTIC SALMON.

Casts of land-locked form (2).
Cast of sea-run form.
Cast of breeding male.
Cast of breeding female.

133. Oncorhynchus chouicha (Walb.) Jor. & Gill. QUINNAT SALMON.

Cast of sea-run form.
Cast of breeding male.

134. Salvelinus namaycush (Walb.) Goode. MACKINAW TROUT.

Casts of Mackinaw form (2).
Cast of Otsego Lake form.
Cast of Toma.

135. Salvelinus fontinalis (Mitch.) Gill. & Jor. BROOK TROUT.

Cast of Caledonia Brook form.
Cast of Moosehead Lake form.
Cast of Common form.

ALBULIDÆ.

136. Albula vulpes (L.) Goode. LADY-FISH.

Photograph.

HYODONTIDÆ.

137. Hyodon tergisus LeS. MOON-EYE.

Photograph.

ELOPIDÆ.

138. Elops saurus Linné. BIG-EYED HERRING.

Photograph.

CLUPEIDÆ.

139. Clupea sapidissima Wilson. SHAD.

Photograph.

140. Clupea vernalis Mitchill. BRANCH ALEWIFE.

Photograph.

ENGRAULIDIDÆ.

141. Stolephorus mitchillii (C. & V.) Jor. & Gilb. ANCHOVY.

Photograph.

CATOSTOMIDÆ.

142. Cycleptus elongatus (LeS.) Ag. BLACK SUCKER.

Photograph.

143. Catostomus commersonii (Lac.) Jordan. COMMON SUCKER.

Photograph.

144. Erimyzon sucetta (Lac.) Jordan. CHUB SUCKER.

Photograph.

145. Moxostoma macrolepidotum (LeS.) Jordan. STRIPED SUCKER.

Photograph.

CYPRINIDÆ.

146. Ptychocheilus oregonensis (Rich.) Girard. SACRAMENTO PIKE.

Photograph.

SILURIDÆ.

147. Amiurus nigricans (LeS.) MISSISSIPPI CAT-FISH.

Cast.

147b. Amiurus ponderosus Bean. GIANT CAT-FISH.

Cast.

148. Ictalurus punctatus (Raf.) Jor. FORK-TAILED CAT-FISH.

Cast.

ANGUILLIDÆ.

149. Conger oceanica (Mitch.) Gill. CONGER-EEL.

Cast.
Photograph.

150. Anguilla rostrata (LeS.) DeKay. COMMON EEL.

Cast.

AMIIDÆ.

151. Amia calva Linné. BOWFIN.

Cast.
Photograph.

LEPIDOSTEIDÆ.

152. Lepidosteus osseus Linné. GAR-PIKE.

Cast.

POLYODONTIDÆ.

153. Polyodon spathula (Walb.) Jor. & Gilb. PADDLE-FISH.

Cast.
Photograph.

ACIPENSERIDÆ.

154. Acipenser oxyrhynchus Mitch. SHARP-NOSED STURGEON.

Photograph.

155. Acipenser brevirostris LeS. SHORT-NOSED STURGEON.

Photograph.

156. Acipenser rubicundus LeS. LAKE STURGEON.

Photograph.

157. Scaphirhynchops platyrhynchus (Raf.) Gill. SHOVEL-NOSE STURGEON.

Photograph.

MYLIOBATIDÆ.

158. Myliobatis fremenvillei LeS. EAGLE RAY.

Photograph.

159. Myliobatis californicus Gill. CALIFORNIA STING RAY.

Photograph.

160. Rhinoptera quadriloba (LeS.) Cuv. COW-NOSED RAY; CLAM-CRACKER.

Cast.
Photograph.

TRYGONIDÆ.

161. Pteroplatea maclura Müll. & Henle. BUTTERFLY RAY.

Photograph.

162. Trygon centrura (Mitch.) Gill. STING RAY.

Cast.
Photograph.

TORPEDINIDÆ.

163. Torpedo occidentalis Storer. TORPEDO; CRAMP-FISH.

Photograph.

RAIIDÆ.

164. Raia erinacea Mitchill. CLEAR-NOSED SKATE.

Photograph.

165. Raia lævis Mitchill. BARN-DOOR SKATE; SHARP-NOSED SKATE.

Photograph.

SQUATINIDÆ.

166. Squatina dumerilii LeS. MONK-FISH.

Cast.
Photograph.

LAMNIDÆ.

167. Lamna cornubica (Gmel.) Fleming. MACKEREL SHARK.

Cast.

CARCHARIIDÆ.

168. Carcharias americanus (Mitch.) Jor. & Gilb. SAND SHARK.

Cast.

ALOPIIDÆ.

169. Alopias vulpes (Gmel.) Bon. THRESHER SHARK.

Cast.

SPHYRNIDÆ.

170. Reniceps tiburo (L.) Gill. SHOVEL-HEAD SHARK.

Cast.

171. Sphyrna zygæna (L.) Müll. & Henle. HAMMER-HEAD SHARK.

Cast.
Photograph.

GALEORHINIDÆ.

172. Isogomphodon limbatus (Müll. & Henle) Gill. SPOTTED-FIN SHARK.

Photograph.

173. Galeocerdo tigrinus Müll. & Henle. TIGER SHARK.

Photograph.

174. Mustelus canis (Mitch.) DeKay. SMOOTH DOG-FISH.

Cast.
Photograph.

SPINACIDÆ.

175. Squalus acanthias Linné. SPINED DOG-FISH.

Photograph.

176. Centroscymnus cœlolepis Boc. & Cap. BROWN DOG-FISH.

Cast.

SCYMNIDÆ.

177. Somniosus microcephalus (Bloch) Gill. SLEEPER SHARK.

Photograph.

PETROMYZONTIDÆ.

178. Petromyzon marinus Linné. SEA LAMPREY.

Cast.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

G.

DESCRIPTIVE CATALOGUE

OF THE

COLLECTION ILLUSTRATING THE SCIENTIFIC INVESTIGATION OF THE SEA AND FRESH WATERS.

BY

RICHARD RATHBUN,

Curator of the Department of Marine Invertebrates in the United States National Museum.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1883.

SECTION G.

INTRODUCTION

Scientific investigations with reference to aquatic life have always received liberal support and encouragement in the United States, alike from National, State, and private organizations, and individuals of wealth. With its long stretches of sea-coast, facing the two great oceans, and extending from near the tropics far beyond the Arctic Circle, and with its many large river systems and innumerable inland lakes, some more deserving of the name of inland seas, this country possesses within its own domains abundant materials for the study of nearly every class of aquatic phenomena, and of nearly all the more important groups of aquatic animals and plants. Since early times these subjects have furnished interesting problems of research to American students of natural history, who, proportionately with the unparalleled growth of the country, have rapidly increased in numbers, and now constitute a large working force.

In consonance with this increase has been the advancement made in our knowledge of the aquatic fauna and flora of the country, which are to-day quite well made out as regards their more characteristic features, notwithstanding that much of the information we have regarding them is exceedingly superficial. Not less interesting in its way has been the development of methods of research, especially during late years, in connection with marine explorations.

The greater portion of the scientific work accomplished, aside from purely anatomical and physiological studies, has been subsidiary to explorations undertaken for practical purposes, and a history of such investigations involves an account of many important industrial and commercial surveys. Exploring parties have seldom been organized for work, at home or abroad, without including one or more naturalists in the corps, and hence nearly all important explorations, of whatever character, have contributed in greater or less proportion to our knowledge of aquatic forms of life and the conditions under which they live.

As in other countries, governmental organizations, through the liberal means generally at their disposal, have accomplished the greatest results. State surveys and fishery commissions have also performed a good work, and private expeditions and societies have added their share.

The United States National Museum, at Washington, established in 1846, is the repository for all scientific collections obtained by national explorations; and the Smithsonian Institution, although substantially independent in its organization, holds close relationship with the Government as an advisory board in scientific matters, and as the custodian of the National Museum. The Smithsonian Institution, since its foundation in 1846, has therefore exerted a powerful influence in regard to American scientific research, and has planned and generally supplied the equipments for natural history collecting to nearly all Government expeditions, as well as to many private surveys and individuals working wholly or in part under its direction.

Most of the national surveys hitherto undertaken have been limited to the territory of the United States and the adjacent waters, although many interesting foreign explorations have been carried on by the Navy Department, the Department of State, and private individuals and organizations. Aside from private enterprises, the surveys of the interior of the United States have been mainly conducted under the Departments of War, and of the Interior the United States Fish Commission, and the several

States; and those of the sea-coasts by the United States Fish Commission and Coast Survey, the Treasury and War Departments, and individuals working in the interest of the Smithsonian Institution. The surveys of Alaska have been made by the Western Union Telegraph expedition, the United States Coast Survey, the Signal Service Bureau of the War Department, and the Treasury Department. Extensive explorations, both at home and abroad, have been carried on by, or under the auspices of, numerous American societies and museums of natural history, and colleges, and notably by the Museum of Comparative Zoology of Harvard College.

Following is given a brief summary of the more important American explorations which have contributed in greater or less degree to a knowledge of aquatic life and the conditions of its existence. Investigations by or under the Government are first considered, and afterwards those by museums, colleges, and private individuals. In connection with the Navy Department, Coast Survey, and Fish Commission, the improvements recently made in the appliances and methods of deep-sea sounding and dredging are briefly described.

THE UNITED STATES AND ADJACENT REGIONS, NOT INCLUDING ALASKA.

The United States Coast and Geodetic Survey.—Although a Bureau of the Treasury Department, this survey has much in common with the Navy, as regards the character and methods of its surveying work, and a large proportion of its members of all grades have been officers detailed from the latter service. Its operations, however, are limited to the vicinity of the coasts of the United States, where the depths of water are seldom very great, and where the phenomena encountered are more diverse. The charts, relief models, and coast pilots exhibited will serve to explain the nature and extent of the hydrographic work thus far accomplished, which consists of observations of depth, of velocity and direction of currents, of bottom, intermediate, and surface temperatures, of the contours of the coast line, &c. In all instances where important bottom specimens have been obtained in sounding, they have been carefully preserved and labeled, and while several reports have already been published upon the subject, vast quantities of such material still await examination.

The sounding appliances now employed by the Coast Survey are probably more perfect than those of any similar service of any country. For the greater depths of water piano-forte wire is used, on the principle of Sir William Thomson, with the improved machine of Commander Sigsbee, which is fully described in the catalogue. In connection with the Navy Department, we have given a brief account of the introduction of steel wire for sounding purposes by the United States Navy. In August, 1874, one of the Thomson sounding machines of the original pattern, was furnished to the Coast Survey steamer Blake, in charge of Commander Howell, United States Navy, and then sounding in the Gulf of Mexico. But few trials were made with it, however, before Lieutenant-Commander Charles D. Sigsbee, United States Navy, succeeded in command of the steamer, in December, 1874. Prior to taking this command, Mr. Sigsbee had planned the original pattern of his own machine on the same principle, shown on plate 7 of Sigsbee's "Deep-sea sounding and dredging" (exhibited). Sigsbee's idea in improving on the original Thomson pattern was, in his words, to obtain a machine "that might be worked with fewer demands on the watchfulness and ingenuity of those having it in charge." This first pattern was used on the Blake during the remainder of his connection with that steamer, or until 1878, when he was succeeded in command by Commander Bartlett, United States Navy. Before his detachment, however, he had already planned a second machine (shown in plates 8 to 12), embodying the improvements suggested by three years' trial and experiment with his original pattern. The first one of this kind was supplied to Commander Bartlett in 1878, and was continued in use for two or three years with the best of results; but in 1880 it was in turn superseded by a third pattern, containing still further improvements. It is this latter machine which is described in the catalogue, and of which a model is on exhibition. Being thus fully

represented and discussed, no further remarks on the subject are necessary, excepting that it may be just to Sir William Thomson to repeat the statement made by Commander Sigsbee in the account of his improved machine, that, "in point of accuracy, the original form of the machine by Sir William Thomson was successful from the start, and it is particularly to be understood that the sufficiency of the machine in that respect is fully recognized."

In addition to his sounding machine, Commander Sigsbee has also introduced many improvements in connection with the accessory appliances used with it. Among these may be mentioned the modification of Captain Belknap's sounding cylinder, and the Sigsbee water-specimen cup, which are fully discussed in the catalogue.

In moderate depths of water, the Coast Survey generally makes use of an ordinary commercial pattern of sounding lead for recovery, with the Stellwagen specimen-cup attachment; but in considerable depths a sounding rod or cylinder is employed, in connection with a perforated cannon ball of the requisite weight. This is, therefore, on the principle of Professor Brooke, excepting that the sounding rod now in use is of a later pattern (the Sigsbee-Belknap cylinder), and the method of attaching the shot is more reliable, as described in the catalogue.

Turning now to the improvements made in the line of deep-sea dredging and trawling, we find that, prior to 1877, in such dredging operations as were occasionally carried on by the Coast Survey, the old methods and appliances were always employed. It remained for the Blake, under Commander Sigsbee, and with Professor Alexander Agassiz in charge of the dredging work, to effect for deep-sea dredging what had just previously been done for deep-sea-sounding. In fact, during those cruises of the Blake from 1877 to 1880, in which dredging formed an essential feature of the investigations, the methods of deep-sea dredging were almost completely revolutionized. On the suggestion of Professor Agassiz, steel-wire dredge rope was first tried for dredging purposes, in the winter of 1877–'78, and proved a complete success, its great superiority over the old hempen rope being soon demonstrated. Its small size ($1\frac{1}{8}$ inches in circumference), its great durability, and the greater ease with which the dredge or trawl can be landed on the bottom by its use constitute its chief qualifications.

It was found that when the common form of dredge fell upon soft mud or ooze in deep water, it became at once filled or clogged with the bottom soil, from its tendency to dig too deeply into the bottom, and was thereby prevented from doing its proper work. To remedy this defect, a new style of dredge was improvised (called the Blake dredge in the catalogue), consisting of a rather large and light rectangular iron frame, attached to a scraping mouth frame, of which the scraping edges are straight and not flaring. The dredges of this pattern rest flat upon the bottom and are very effective in their results, on soft materials.

The beam-trawls were modified at the same time so as to work either side down—a great convenience in deep water, where it is often impossible to lower the ordinary pattern so that it will rest right side up on the bottom. Another important invention of these cruises was the Sigsbee gravitating trap, for obtaining evidence as to the quantity of animal life between any two given depths.

The dredging explorations of the Coast Survey on the eastern coast of the United States have been of a very interesting nature, and much pioneer work has been successfully accomplished. Deep-sea dredging was inaugurated May 17, 1867, in the region of the Gulf Stream, off the south coast of Florida, by the steamer Corwin, Count L. F. de Pourtales, then an assistant of the Survey, being in charge of the dredging operations. This cruise was undertaken for the purpose of sounding out a line for a telegraph cable between Key West and Havana. Only a few dredgings (in depths of 90 to 350 fathoms) were made the first season, on account of the breaking out of yellow fever on board the steamer, but "the highly interesting fact was disclosed that *animal life exists at great depths, in as great a diversity and as great an abundance as in shallow water.*" During 1868 and 1869, the same series of dredgings was continued, by the steamer Bibb, in the Florida Straits, between Cape Florida and Tortugas, and

were carried down to a depth of 700 fathoms, with equally interesting results. The first report of these investigations was published by Mr. Pourtales in December, 1867, being a brief account of the first year's work, with descriptions of many of the species of animals obtained. More complete reports have since been issued by the Museum of Comparative Zoology of Harvard College, under which auspices nearly all of the deep-sea dredging of the Coast Survey on the eastern and southern coasts of the United States have been accomplished. The relations which have long existed between this Museum and the Coast Survey are more fully discussed in connection with our account of the former institution.

During 1871 and 1872, the Coast Survey steamer Hassler, which had been built for service on the western coast, made her trip from the Atlantic coast to San Francisco, via Cape Horn, having on board Prof. Louis Agassiz and a party of naturalists, including Mr. Pourtales, in charge of dredging operations. Arrangements had been made whereby such natural-history explorations as would not interfere with the regular work of the survey might be carried on in the course of the long voyage. The expenses of the civilian party were paid by private subscriptions raised in Boston. Dredgings were made mainly in the vicinity of the Barbadoes, and along the east and west coasts of South America, and collections were also obtained from the surface and from the shores wherever the vessel touched. The principal points of interest visited were St. Thomas, the Barbadoes, Rio de Janeiro, Montevideo, the Straits of Magellan, many places on the west coast of South America, Juan Fernandez, the Galapagos, and Panama.

In 1872, 1873, and 1874, for a short period each summer, the Coast Survey steamer "Bache" was detailed for dredging work in the Gulf of Maine, in the interest of the United States Fish Commission. These were the first series of off-shore dredgings made on this section of the coast, and they were carried down to a depth of 430 fathoms.

In 1877 began that most interesting series of explorations by the Coast Survey steamer "Blake," during which the methods of deep-sea dredging and sounding were so greatly improved, as has been described above. The dredging operations were in charge of Mr. Alexander Agassiz. The first cruise, during which Commander Sigsbee, United States Navy, was in charge of the vessel, lasted from December, 1877, to March, 1878, and extended from Key West to Havana, and thence westward along the north coast of Cuba; from Key West to the Tortugas, the northern extremity of the Yucatan Bank and Alacran Reef, to Cape Catoche, and across to Cape San Antonio; thence back to Key West, and from there to the mouth of the Mississippi River. Seventy-nine casts were made, the deepest being in 1,920 fathoms. During the second cruise, from December, 1878, to March, 1879, under Commander Bartlett, United States Navy, dredgings were made from Key West to Havana; thence to Jamaica, through the old Bahama Channel and Windward Passage, and from Jamaica to St. Thomas, along the south coasts of Hayti and Porto Rico. From St. Thomas the dredgings were continued southward as far as the 100-fathom line off Trinidad. This season over 200 successful casts of the dredge and trawl were made in all depths down to 2,412 fathoms. The third cruise, from February to May, 1880, covered the western Caribbean Sea, between Cuba, Jamaica, and Honduras; 22 hauls were made, the deepest in 961 fathoms. The fourth cruise, during the summer of 1880, was devoted to running several lines of soundings and dredgings off the Atlantic coast of the United States, between George's Bank and the latitude of Charleston, in depths of 24 to 1,632 fathoms; 47 dredge and trawl hauls were made.

The general scientific results of these explorations have been published by Mr. Agassiz in several reports, contained in the Bulletin of the Museum of Comparative Zoology, and special descriptive reports on many of the groups of animals obtained have also been issued.

Many of the Coast Survey tidal observers, stationed at different places along both the east and west coasts, have contributed largely to a knowledge of the marine fauna in the vicinity of their stations. Among these have been several trained collectors

and naturalists, appointed on the recommendation of the Smithsonian Institution. One of the most indefatigable collectors was Mr. John Xantus, who, prior to his appointment on the Coast Survey, spent over a year, from the summer of 1857 to the fall of 1858, at Fort Tejon, California, in making a complete collection of the zoology of that region. In April, 1859, he went as tidal observer to Cape Saint Lucas, Lower California, where he remained until 1861, keeping up, during the entire period of his stay, the most active field work in all branches of zoology, marine fishes and invertebrates constituting a very important feature of his collections, which were as nearly exhaustive of the fauna, as was possible in two years' time. His operations extended some distance up both the gulf and ocean sides of the peninsula of Lower California, and to Mazatlan, in Mexico. His notes were very full and comprehensive, and his collections were all received at Washington in the best of condition. In 1862, as an agent of the State Department, he visited Manzanillo, Western Mexico, and making that place and Colima his headquaters, he collected in all directions, but especially toward the interior mountainous region, obtaining most valuable results regarding the distribution of animals, including both fresh-water fishes and mollusks.

During 1853–'55, Mr. R. D. Cutts, Assistant on the Coast Survey, then surveying on the coast of California, made valuable collections of fishes for the Smithsonian Institution, and from 1854 to 1855, Lieutenant W. P. Trowbridge, United States Army, tidal observer, collected in the same region, sending to Washington a very large assortment of marine fishes and invertebrates. From 1854 to 1859, Dr. Gustavus Wurdemann, of the Coast Survey, devoted his spare intervals of time to collecting marine animals along the coast of the Southern States, from Louisiana to South Carolina, and the collections supplied by him were the most complete of any obtained from that region up to the time of his death, in 1859.

Since 1860, numerous small collections have been received, from time to time, from tidal observers and other employés of the Coast Survey, aside from the dredging explorations above described.

In this connection may be mentioned the incidental collections made since 1881 by Lieutenant Henry C. Nichols, United States Navy, in command of the Coast Survey steamer "Hassler," on the west coast of North America, from Alaska to Mexico and the Gulf of California. The collections received from Lieutenant Nichols at numerous intervals have contained many interesting discoveries both among fishes and invertebrates.

The United States Commission of Fish and Fisheries was established in 1871, in accordance with a joint resolution of Congress, authorizing the appointment of a commissioner of fish and fisheries, whose duties were defined as follows: "To prosecute investigations on the subject (of the diminution of valuable fishes), with the view of ascertaining whether any and what diminution in the number of food-fishes of the coast and the lakes of the United States has taken place; and, if so, to what causes the same is due; and also whether any and what protective, prohibitory, or precautionary measures should be adopted in the premises, and to report upon the same to Congress." The resolution further specified that the commissioner to be appointed should be a civil officer of the Government, of proved scientific and practical acquaintance with the fishes of the coast. Professor Spencer F. Baird, at that time assistant secretary of the Smithsonian Institution, received the appointment, and entered at once upon his duties.

The plan of work adopted included "the systematic investigation of the waters of the United States and the biological and physical problems which they present; the investigation of the methods of fisheries, past and present, and the statistics of production and commerce of fishery products; and the introduction and multiplication of useful food-fishes, especially in waters under the jurisdiction of the General Government." We need consider here only that phase of the Fish Commission which relates to the scientific investigation of the waters.

The newly-appointed Commissioner, with a just appreciation of the bearing which

all scientific problems relating to aquatic life have upon the fishery question, began at once upon a liberal and far-sighted policy, which has been productive of most satisfactory results, and probably no similar commission of any country of the world has made more rapid advancement or been more successful in its application of scientific results to practical aims. One of the first steps in entering upon the new project was to secure the services of eminent specialists in the different groups of aquatic animals and plants, as associates and assistants in making collections and observations, and in reporting upon the different classes of objects and phenomena which come within its scope. In the selection of his corps Professor Baird has been exceptionally fortunate, as the many valuable reports issued under his direction amply testify. The small appropriations at his command in the beginning made it necessary to depend largely upon volunteer assistance, and many of the most important scientific results have been obtained through the aid of unpaid labor.

In the summer collecting work, several college students have participated nearly every year, for the sake of the training they could thereby obtain, and their services have been of the greatest assistance to the Commission.

As by far the most important of the American fisheries center upon the New England coast, this region demanded first attention, and during every summer, but one, since the Commission was started, a well-organized scientific party, in charge of the Commissioner, has systematically explored its waters with every known appliance suited to the purpose. During the first two years nearly all the dredging and trawling work was accomplished with the aid of small sail boats or steam launches, and the hauling-in was done by hand. From the third to the ninth year, through the liberality of the Navy Department, small naval steamers or tugs were detailed for the use of the Commission, and enabled the explorers to extend their operations to greater depths and to a greater distance from land. In the summer of 1880, the Fish Commission steamer "Fish-Hawk" was first available for scientific investigations, and being furnished with all the improved dredging appliances, that had been lately introduced by the Coast Survey, as well as with those previously used by the Fish Commission, and with a sounding machine for the use of piano wire, it was possible to still further enlarge the field of work, and increase the accuracy and rapidity of observations.

The present spring (1883) there has been added to the Fish Commission fleet another and much larger exploring steamer, the "Albatross," which combines every necessary convenience to adapt her to the requirements of marine research in all its branches. She has been built expressly to explore the off-shore fishing grounds, and study the distribution and habits of all the useful species of fish, whether bottom-feeding, like the cod and halibut, or surface-schooling, like the mackerel and menhaden. But her operations will not be limited to the practical side of the fishery question, for she will also engage in deep-sea sounding and dredging and in the taking of oceanic temperatures, and, in fact, in all researches bearing upon the biology of the ocean. She was only completed in February last, and the few trips she has yet made have been mainly for the purpose of testing her machinery and scientific appliances which are now in perfect running order. Her first regular cruising will begin about July 1. Her outfit is very complete, and comprizes all the most approved appliances now recognized by fishermen and naturalists for collecting marine specimens. Many novel features have also been introduced, as described in the catalogue, and she is regarded as the most perfect floating workshop and laboratory for scientific research ever constructed.

The several steamers which have been in the service of the Commission, as well as those now belonging to it, have all been manned by naval crews and commanded by naval officers, to whose untiring zeal and deep interest in the exploring work is largely due the successful results of dredging. Commander (now Captain) L. A. Beardslee, United States Navy, was in charge of the dredging steamers from 1873 to 1875, inclusive, and again in 1878; Lieutenant-Commander (now Commander) A. G.

Kellogg, United States Navy, in 1877; and Lieutenant (now Lieutenant-Commander) Z. L. Tanner, United States Navy, from 1879 to date. The latter officer is now in command of the steamer "Albatross," which was constructed and equipped under his direct supervision. His previous four years of service on the Commission's steamers, "Speedwell" and "Fish Hawk" especially qualified him for this duty, which has been discharged to the satisfaction of all.

In the sea-coast exploring work of the Fish Commission, the department of fishes was, during the first two or three years, under the immediate supervision of the Commissioner, with the assistance of Professor Theodore Gill and Mr. G. Brown Goode. Since then Mr. Goode has taken direct charge of this department, with the co-operation of Dr. Tarleton H. Bean, and the assistance of many others. Mr. J. W. Milner, Assistant Fish Commissioner from 1871 to 1877, took charge of the fresh-water fishery investigations up to the time of his death, the latter year. Professor A. E. Verrill, of Yale College, has had charge of the dredging operations, and the section of marine invertebrates, and has been assisted for variable periods by many naturalists and students of zoology, who have studied special groups of animals, or aided in the general work of collecting, assorting, and identifying materials. Among the associates and assistants who have taken a more or less prominent part in this line of research may be mentioned Professor S. I. Smith, Mr. Oscar Harger, and Mr. J. H. Emerton, of Yale College; Professor A. S. Packard, jr., of Brown University; Professor Joseph Leidy, of Philadelphia; Professor Alpheus Hyatt, of Boston; Mr. Sanderson Smith, of New York; the late Dr. P. P. Carpenter, of Montreal; Dr. E. B. Wilson, of Johns Hopkins University; Professor S. F. Clarke, of William's College; Professor H. E. Webster, of Union College; Professor W. N. Rice, of Wesleyan University; Professor J. E. Todd, of Tabor College; Drs. J. H. Kidder and T. H. Streets, United States Navy; Mr. William H. Dall and Mr. R. Rathbun, of Washington; Mr. Caleb Cook, of Salem; Professor L. A. Lee, of Bowdoin College; and Messrs. B. F. Koons, H. L. Bruner, and Edwin Linton. The marine algæ have been intrusted to Professor William G. Farlow, of Harvard College, and Professor D. C. Eaton, of Yale College. The dredging operations have been superintended by Captain H. C. Chester, whose skillful management of the different appliances of research have rendered his services of the greatest value to the exploring work. Mr. Vinal N. Edwards, an experienced collector, has been retained permanently at Wood's Holl, Massachusetts, since 1871, for the purpose of making observations and collections outside of the regular summer season. His contributions toward a knowledge of the fauna of that region have been very extensive.

In conducting the summer explorations, it has generally been customary to select a different place each season as a central station, from which collecting goes on in all directions. The object of these annual changes has been to cover every portion of the coast, all of which is of great zoological and practical interest. A suitable laboratory is fitted up with the requisite number of tables to accommodate the specialists and assistants, and with aquaria, storage shelves, and other conveniences, and all of the specimens collected are brought there for study and preservation. In addition to the regular systematic, anatomical and embryological studies of the different species of animals, careful preparations are made for museum display, and large quantities of duplicates of all the species obtained in abundance are saved for distribution to institutions of learning throughout the country, and for use in making exchanges.

The entire New England coast has already been quite fully explored, from the shore down to considerable depths of water. Every possible method of obtaining specimens and information has been resorted to. Shore collecting, by means of the seine, spade, dip-net, and other simple contrivances has been especially thorough. Beyond slight depths all of the various kinds of dredging appliances have been used, and many new forms of apparatus have been devised for special purposes. The fish pounds, weirs, &c., have been constantly visited, and the fish markets have been closely watched for any new treasures they may reveal. The services of the fisher-

men have also been enlisted to save and bring in any odd creatures that may be caught by their hooks or nets. After thirteen years of such thorough collecting as has been detailed, it is natural to suppose that a very good general idea of the character of the aquatic fauna of the New England coast has been obtained.

An especial feature of the summer's work during several years has been the photographing of fishes and fishing scenes, by Mr. T. W. Smillie, whose numerous views on exhibition need no words of praise from us.

The necessity of a permanent marine station, with suitable arrangements for more careful embryological and anatomical, as well as systematic studies, and for the purposes of fish-breeding, has been felt for several years, and preparations toward the accomplishment of such a project are now nearly completed. The place selected is Wood's Holl, Massachusetts, where all the surroundings are especially favorable for a marine zoological laboratory. Strong tidal currents produce a constant circulation of pure sea water, even close in to the shore, and fresh-water streams are entirely absent from the vicinity. The temperature of the water is also suitable, and no locality on any part of the eastern coast has been more highly regarded for the study of free-swimming larval forms of marine animals at all seasons. The scheme proposed is exceedingly comprehensive, and contemplates, in addition to the usual laboratory buildings and fixtures, several large open basins, in direct communication with the surrounding water, for the study of the life histories and the habits of marine fishes and invertebrates, especially those of economic importance. These basins will be inclosed in a large wharf, intended for the use of steamers of the Commission. It is proposed to have these improvements completed by the summer of 1884, and thenceforward they may be used at any or all seasons of the year, as is desirable.

In 1871, the first year of the Fish Commission, the summer station was at Wood's Holl, and about 250 hauls of the dredge and beam trawl were made in the surrounding region. In 1872, Eastport, Maine, became the headquarters, and the explorations covered both the shallow and deeper areas at the mouth of the Bay of Fundy, down to a depth of 106 fathoms; 235 dredge hauls were made. In 1873, with headquarters at Portland, Maine, 149 dredging stations were made in and about Casco Bay; and in 1874, with headquarters at Noank, Connecticut, 223 casts of the dredge and trawl were made in the eastern part of Long Island Sound. During two or three weeks of each summer, from 1872 to 1874, inclusive, the Fish Commission was allowed the use of the Coast Survey steamer "Bache," for dredging purposes in the Gulf of Maine and the region of George's Bank, where many valuable results were obtained. In 1875, Woods' Holl was again selected as the summer station, and 169 dredge hauls were made in the region of Vineyard Sound. The Centennial year, 1876, was devoted to arranging and displaying the results of the investigations of the Commission at the Philadelphia Centennial Exhibition, and no systematic explorations were carried on. Salem, Massachusetts, was made the central station during the first part of the summer of 1877, but from the last of August until October, while the Commission of arbitration on the fishery claims was in session at Halifax, the station was removed to the latter place. On the passage from Salem to Halifax, a complete and interesting line of dredgings was made across the Gulf of Maine, and later numerous deep hauls were successfully taken off the coast of Nova Scotia. Gloucester, Massachusetts, became the station in 1878, and Provincetown, Massachusetts, in 1879, during which years the explorations covered Massachusetts Bay, and extended off the coast of Massachusetts into depths of 175 fathoms. From 1877 to 1879, inclusive, 378 hauls were made with the dredge and trawl.

While at Gloucester, in 1878, a scheme for obtaining marine animals of all kinds from the offshore fishing banks was successfully inaugurated, through the aid of the Gloucester cod and halibut fishermen, to whom the Fish Commission is chiefly indebted for its knowledge of the fauna of those unexplored areas. Large quantities of fishes and invertebrates, of no economic value, are constantly being caught on the hooks or entangled on the lines of the fishermen, who, considering them of no impor-

tance, generally throw them away, excepting in the case of hardy corals and like objects. Being convinced of the value of such specimens to the objects of the Commission, a few intelligent fishing captains expressed a willingness to carry with them on their trips tanks of alcohol for the preservation of any "curios" they might obtain. The success attending the first ventures, excited a lively interest among the fishermen, and the demand for tanks soon became quite general. In fact, the idea came to prevail on some of the fishing schooners that the presence of a collecting tank was essential to a good fare, and they would not go to sea without one. The different schooners often vied with one another in the extent and value of their captures, which were frequently of great interest. The practice of carrying tanks continued without cessation for a period of about three years, and the number of contributions exceeded 900. Many of these contributions, moreover, filled an entire tank, which may have contained a hundred or more specimens, and a large number of species. The showing made by the Gloucester fishermen in the cause of science has certainly been very creditable, and their entire work was carried on without remuneration. One of the most indefatigable of these collectors was Captain J. W. Collins, whose "aids to science" were very extensive; he has since become a member of the Commission.

Three interesting collecting trips to the fishing banks grew out of these investigations. The first was made in 1878, by Mr. R. L. Newcomb, to the Grand Banks, with Captain Collins, and the second and third in 1879, by Mr. N. P. Scudder, to the halibut banks of Southern Greenland, and by Mr. H. L. Osborn to the Grand Banks.

In 1880 the regular summer station was established at Newport, Rhode Island, from which place the steamer "Fish Hawk" made her first dredging cruises to the Gulf Stream slope. This latter region proved so rich in animal life that it was decided to return to it in 1881, and again in 1882, but the headquarters were transferred to Wood's Holl, which offered superior accommodations as a harbor and laboratory station. From 1880 to 1882, inclusive, 385 dredging and trawling stations were made, mainly in depths of 50 to nearly 800 fathoms. The results of these explorations have far exceeded all possible expectations, and have demonstrated the existence of an extremely rich faunal belt, following the line of the inner edge of the so-called Gulf Stream slope, from as far south at least as off Cape Hatteras to the great fishing banks off the British Provinces. The great flood of material resulting from these investigations has greatly enriched the collections of the Fish Commission, and afforded a vast number of unique types for study.

Voluminous reports on the discoveries made by the Fish Commission in connection with its regular marine researches are contained in the collection of scientific literature exhibited. Up to date, nearly 1,900 hauls have been made with the different kinds of dredging appliances, including the common form of dredge, the rake dredge, the Blake dredge, the single and double beam trawls, and the tangles. At the majority of dredging stations careful temperature observations have been taken both at the surface and bottom, and often at intermediate depths, and many specific gravity observations have also been recorded. The towing-nets have been freely used principally at the surface, but also very frequently at intermediate depths and at the bottom. In connection with embryological studies of marine invertebrates, they have been constantly utilized, especially at Wood's Holl. Over 700 hauls of the seine have been made by the fishmen along the shores, and at the mouths of rivers in the neighborhood of the summer stations. On most of the dredging trips of the steamers to deep water, it has been customary to set several long cod trawl-lines, similar to those in use by the Banks fishermen, in order to capture such bottom fish as are too active to be caught in the beam trawl. Many valuable additions to the fauna have been made by this means. Among many interesting researches out of the ordinary line may be mentioned those of Dr. J. H. Kidder, United States Navy, at Provincetown, in 1879, on the animal heat of fishes, in which large numbers of specimens were experimented with; those of Captain L. A. Beardslee, United States Navy, on the errors to record in the Miller-Casella deep-sea thermometers; and those of Professors Ver-

rill and Rice, on the action of poisons on certain marine invertebrates, with a view to killing them in an expanded condition, suitable for study.

Important series of temperature observations have been conducted for the benefit of the Commission as follows: By the light-house keepers along the Atlantic coast; by the menhaden fishermen on their fishing trips; and by the Signal Service observers stationed on the interior rivers and lakes. Valuable assistance has also been rendered by the life-saving crews stationed along the coast, who are under instructions to report by telegraph to the Fish Commissioner the appearance or stranding of any unusual large fish or cetacean in the neighborhood of their station. Several interesting discoveries have already been made by this means, and also by information from light-house keepers.

Very many important improvements have been made by the members of the Commission, from time to time, in dredging and other appliances of research, which are fully described in the catalogue. The most noteworthy of these are the rake dredges, tangles, table and cradle sieves; the Tanner sounding machine, for use with wire; and the Bailie-Tanner deep-sea thermometer case.

According to an official report of the Commission, published in 1880, 800 species of marine invertebrates had been recorded from the New England coast, and adjoining regions, prior to 1871. To this number the Fish Commission added up to, but not including, the summer of 1880, about 1,000 described species, which were either new, or previously regarded as extra limital, making a total of 1,800 species of marine invertebrates known to inhabit this region at the close of the first decade of the Commission. In this enumeration no account has been taken of several groups of invertebrates on which no special studies have as yet been made. The same report records the discovery, during the same period, of over 100 species of marine fishes from the eastern coast of the United States, of which one-half were new to science, and several of economic value. Forty species were from north of Cape Cod, and 17 from the coast of the Gulf of Mexico, the remainder being from the intervening region. In addition to the above, over 60 species of fishes were added to the fauna of the Pacific coast, through the efforts of the Fish Commission. Since 1879, the scientific results have been even greater in proportion than previously, and about 40 species of fishes have been added to the New England region, increasing the number of species known from that section of the coast to over 230.

No enumeration has been lately made of the invertebrate additions, but they amount to several hundreds, and are mainly from the region of the Gulf Stream slope off the New England coast, in depths of 100 to 800 fathoms. This region is undoubtedly one of the very richest in the world, both as regards the abundance and variety of animal life. It will be again included in the scope of the explorations for 1883.

While the systematic explorations of the Fish Commission have not yet been extended to the Pacific and Gulf coasts, nor to the southward of Cape Hatteras, on the Atlantic coast, special collectors have aided greatly in developing the littoral and shallow-water faunæ of those regions. The census operations of 1880 gave a new impetus to this work, and the special coast experts were instructed to make large collections, wherever they went. These researches were also extended to the region of the Great Lakes and to the interior rivers. A large amount of valuable material bearing upon both the salt and fresh water fisheries of the United States and the food of fishes was the result.

In 1871, the late Mr. J. W. Milner, Assistant Fish Commissioner, began a series of careful explorations of the Great Lakes and other fresh-water areas, which he carried on more or less continuously up to the time of his death, in 1879. The first year was devoted exclusively to Lake Michigan, where, in addition to other collecting, numerous dredgings were made in depths of 30 to 144 fathoms. The invertebrates obtained were referred to Dr. William Stimpson, at Chicago, for study, but they were soon afterward destroyed in the great fire of October, 1871, before they had been carefully examined. During 1872 and one or two years following it, Lake Superior and the other

more eastern lakes were explored in considerable detail; but Mr. Milner's services were soon demanded for the more important problem of fish culture and distribution, which thereafter occupied the greater part of his time. In 1879, however, while in Florida for the benefit of his health, he made interesting collections of fishes, mainly on the west coast. After his death his duties were assumed by Major T. B. Ferguson, the present Assistant Commissioner, who has charge of the propagating work.

Mr. C. G. Atkins, in charge of the hatchery at Bucksport, Maine, has made frequent contributions, especially of fresh-water fishes from the State of Maine. During 1871, Dr. H. C. Yarrow, United States Army, stationed at Fort Macon, made a careful study of the food-fishes of the North Carolina coast for the Commission, and obtained large collections of fishes and marine invertebrates. Mr. Silas Stearns, of Pensacola, Florida, has, for a number of years, acted as an agent of the Fish Commission on the coast of the Gulf of Mexico, studying the fisheries, and making collections of all kinds of marine animals. Through his exertions, several new species have been added to the fauna of that region.

Mr. R. E. Earll and Colonel M. McDonald conducted the census investigations of the general fisheries of the Southern Atlantic coast, during 1880, and made extensive collections of economic and other fishes and invertebrates. During the same period, Mr. Ernest Ingersoll accomplished like results for the oyster and other economic mollusks. In 1876, Mr. L. Kumlien collected in Texas, and more recently Dr. R. W. Shufeldt, United States Army, has been studying in great detail the aquatic fauna of the Mississippi Delta, which has hitherto received but little attention. Mr. E. G. Blackford and Mr. Fred Mather, of New York, have both rendered important services to the Fish Commission ever since its organization, especially with reference to the extensive fisheries which center at New York City. In 1874, Mr. Mather also made a large collection of fishes in Michigan, and since then in New York, Long Island Sound, and elsewhere. Captain N. Atwood, of Provincetown, Massachusetts, and Mr. S. Powel of Newport, Rhode Island, have aided the Commission greatly by numerous contributions from time to time.

On the Pacific coast, the more important explorations have been by Professor D. S. Jordan and Mr. C. D. Gilbert, who carried on the census investigations of that region, and made enormous collections of fishes, embracing over 60 new species. They also obtained an abundance of invertebrates. Mr. J. G. Swan, of Port Townsend, Washington Territory, has, from time to time, sent valuable zoological contributions from the region of Puget Sound; and Mr. Livingston Stone has collected extensively in the fresh waters of the Western States and Territories, and especially in California and Oregon. Other naturalists and collectors on the west side to whom the Fish Commission is greatly indebted for materials and observations are Professor R. E. C. Stearns, Mr. Henry Hemphill, Mr. L. Belding, Mr. W. N. Lockington, and Mr. Andrea Larco.

In connection with the work of fish-hatching, which is described in another section, very interesting and valuable embryological studies have been made by Mr. J. H. Ryder, of the Fish Commission, and Professor W. K. Brooks and Mr. H. J. Rice, of Johns Hopkins University, on the oyster, shad, mackerel, and many other important food-fishes.

War Department.—Explorations of Colonel Totten, United States Army, in marine zoology, along the New England coast, beginning about 1834. Exploration of the Red River of Texas, in 1851–'52, by Captains R. B. Marcy and George B. McClellan; collections of fishes mainly. Zoological collections at the Tortugas, Florida, by Captain H. G. Wright, from 1851–'54; fishes mainly.

Explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean, from 1853 to 1857, under the direction of the Secretary of War, according to acts of Congress in 1853 and 1854. These explorations were carried on by some seven or eight distinct parties, each under command of an officer of the Army, and covered a vast area of territory lying between the parallels of 32° and 47° north lati-

tude, the greater portion of which was previously unknown to science. The surgeons attached to each of the parties, and also several of the line officers, devoted much of their time to natural-history investigations and accomplished very flattering results. As might be naturally inferred, most attention was paid to the terrestrial animals, but very large collections were made of fresh-water fishes everywhere, and of marine animals in the vicinity of Puget Sound. Each party was fully supplied with all the necessary collecting apparatus, and were given complete instructions as to the manner of making natural history collections. The explorations along the forty-seventh parallel of latitude, from Saint Paul, Minnesota, to Puget Sound, were in charge of Major Isaac I. Stevens, afterwards governor of Oregon Territory, and were begun at both ends of the route at the same time. Dr. G. Suckley, United States Army, acted as naturalist of the eastern section, and Dr. J. G. Cooper of the western, both giving nearly their entire time to zoological investigations. After the abandonment of the expeditions, Doctors Suckley and Cooper continued their collecting for some time on the northwest coast, the former being stationed as surgeon at Fort Steilacoom, and the latter working in the vicinity of Shoalwater Bay. The collections sent home by these two naturalists were very large and of extreme value; they embraced every department of zoology, and included large quantities of marine and fresh-water fishes and marine invertebrates. Their explorations of Northern Oregon and Washington Territories were especially thorough, both as regards the sea-coast and interior waters. Dr. C. B. R. Kennerly was naturalist of the route along the thirty-fifth parallel, under Lieutenant A. W. Whipple, and collected large quantities of fresh-water specimens along the route, and of marine specimens in the vicinity of San Francisco, California.

Collections of fresh-water fishes in Texas and Northern Mexico by Lieutenant D. N. Couch, in 1853. Exploration of the Brazos River, Texas, in 1854, by Captain R. B. Marcy, Dr. G. G. Shumard, naturalist. Exploration of the Black Hills (Upper Missouri and Yellowstone Rivers), in 1856–'57, by Lieutenant G. K. Warren. Survey of a wagon road from Fort Riley to Bridger's Pass, under Lieutenant F. T. Bryant, in 1856–'57. Explorations of a canal route across the Isthmus of Darien, in 1857, under Lieutenant N. Michler, A. Schott, naturalist. Explorations in Kansas, Nebraska, and Utah, by Dr. G. Suckley, in 1859. Large collections of zoology at the Tortugas, Florida, by Captains H. G. Wright and D. P. Woodbury, in 1859, and along the Atlantic coast of the States, by Lieutenant J. D. Kurtz, in 1860. Collections of marine invertebrates, chiefly mollusks, from the Gulf of California, by Captain C. P. Stone, in 1860.

Explorations of Dr. Elliott Coues, in the Western States and Territories, since 1860, a portion of the time as chief naturalist of Hayden's Geological Survey; on the coast of Labrador in 1860, and at Beaufort, North Carolina, in 1868. Geological survey along the fortieth parallel of north latitude, under Clarence King, from 1867–1879. Very large collections of marine fishes and invertebrates from the Atlantic coast, in the vicinity of Fort Macon, North Carolina, during 1870 and 1871, by Dr. H. C. Yarrow.

Explorations and surveys west of the one hundredth meridian, under the direction of General A. A. Humphreys, Chief of Engineers, by Lieutenant George M. Wheeler in charge, from 1872–'79. The naturalists of this survey were Dr. H. C. Yarrow, Mr. H. W. Henshaw, Professor Newberry, Mr. Charles E. Aiken, Dr. J. T. Rothrock, and Oscar Loew, and their field of operations included the fresh-water lakes and rivers of Utah, Colorado, New Mexico, Arizona, and Western and Southwestern Nevada, Salt Lake, Utah Lake, and other salt-water lakes, and the Pacific coast in the vicinity of Santa Barbara, California.

Survey of the northern and northwestern lakes and rivers, under General C. B. Comstock, United States Army, Corps of Engineers. In August and September, 1871, Professor S. I. Smith, of Yale College, conducted a successful series of dredgings, covering nearly the entire area of Lake Superior, in connection with this survey. The greatest depth attained was 169 fathoms. Bottom and surface temperature observa-

tions were also taken by Professor Smith, as well as by the survey in the course of its regular work.

Collections of fresh-water mollusks from New Mexico and Arizona, in 1876, by Lieutenant W. L. Carpenter. Explorations of Captain Charles Bendire, while stationed in several of the Western States and Territories, and especially in California, Arizona, Oregon, and Washington Territory, mainly with reference to the fresh-water fishes (*Salmonidæ*) and cray-fishes.

Exploration of the Mississippi Delta, in 1882 and 1883, by Dr. R. W. Shufeldt, United States Army.

Interior Department.—Explorations for a wagon road to California, by way of the South Pass, in 1857–'58, Dr. James G. Cooper, naturalist. United States and Mexican Boundary Survey, from 1851–'55, under Colonel J. D. Graham and Major W. H. Emory, United States Army. The collections of zoology were extensive and covered the region of the Rio Grande River, from Eagle Pass to its mouth.

Hayden's Geological Survey. The most extensive series of scientific explorations under the Interior Department and General Land Office have been those of the so-called Hayden's Surveys of the Western Territories, which, although organized mainly for geological investigations, have accomplished much in the way of making known the aquatic fauna of the extensive region included within its scope, being almost the entire western half of the United States, with its many large river systems and lakes, These surveys were begun in 1867, and continued until the reorganization of the system of geological surveys in 1879. Several naturalists were attached to the field parties every year, many of them being volunteers who took these opportunities to make collections in their special lines of research. Many valuable contributions have been published from time to time on the collections of aquatic animals obtained. Among the prominent naturalists interested in aquatic forms, who participated in these surveys, have been Dr. Elliott Coues, Professor E. D. Cope, Dr. Joseph Leidy, Professor A. S. Packard, jr., and Mr. Ernest Ingersoll.

State Department.—Survey of the northwestern boundary line, under Archibald Campbell, Commissioner, from 1857 to 1861, Dr. C. B. R Kennerly surgeon and naturalist. Large collections were made in Puget Sound and at the mouth of Fraser River. The same survey was continued farther east during 1873–'74, with Dr. Elliott Coues, United States Army, as naturalist.

Treasury Department.—To Captain C. M. Scammon, of the Revenue Marine, stationed on the west coast of North America, we are indebted for a valuable series of observations on the whales and other cetaceans of the North Pacific Ocean, extending through several years. His contributions to the National Museum have been very extensive. and include the skeletons and skulls of numerous species of cetaceans.

During the spring of 1883, arrangements were made with the Life-Saving Service of this Department, whereby the stranding of any large animal of unusual appearance in the neighborhood of any of the life-saving stations is telegraphed at once to the United States Fish Commissioner. Through this means several important discoveries of large marine fishes and cetaceans have already been made, and the specimens sent to Washington in suitable condition for study and preservation. Similar information and specimens have also been received from light-house keepers on the Atlantic coast.

Smithsonian Institution.—The following natural history explorations of a more private nature were conducted, wholly or in part, under the auspices of this institution.

Fishery investigations of Professor S. F. Baird. During the earlier period of his connection with the Smithsonian Institution, and for several years previously, Professor Baird spent the summer months mainly in exploring the fresh waters of the Northeastern United States, and in making large collections of fishes and reptiles. The area covered by his researches included the Eastern and Middle States, Virginia, Ohio, Indiana, Illinois, Michigan, and Wisconsin, the Great Lakes, the Saint Lawrence River, and the Ohio River. The summers of 1854 and 1855 were devoted to a study of the fishes of the New Jersey coast, in the vicinity of Beesley's Point. In all

of these explorations very large collections were made. Professor Baird's work as United States Fish Commissioner has already been spoken of.

Robert Kennicott and the Hudson's Bay Company. From 1853 to 1859, Mr. Kennicott carried on extensive explorations in Illinois, Minnesota, and the region of Lake Winnipeg, making interesting collections of aquatic and terrestrial animals. In 1855 he brought together, for the Agricultural Fair, at Chicago, Illinois, one of the most complete State collections of natural history ever made up to that time, and a large part of which was later contributed to the Smithsonian Institution. From 1859 to 1861, under the auspices of the Smithsonian Institution, the Chicago Academy of Sciences, the Chicago Audubon Club, and the University of Michigan, and with the assistance of the officers of the company, Mr. Kennicott conducted a series of explorations along the line of the Hudson's Bay Company's posts, from the Red River settlement, along the Red River of the North and the Mackenzie River, to the headwaters of the Yukon River, bringing back with him immense collections, representing the aquatic fauna of the entire region visited. Many valuable collections of fishes have also been received at intervals, since 1859, from the officers of the Hudson's Bay Company, and especially from Mr. R. McFarlane, and Mr. McDougal, between 1860 and 1868, the former collecting in the vicinity of Fort Anderson, on the Arctic Ocean, the latter in the Mackenzie River district.

In 1854, Dr. P. R. Hay and the Rev. A. C. Barry, of Racine, Wisconsin, made large contributions of fishes, the former from Western Missouri and Kansas, the latter from Northern Wisconsin.

Explorations on the Atlantic and Gulf coasts: Dr. William Stimpson, from 1850 to 1871, on the New England coast, and the coasts of North Carolina and Florida; marine invertebrates mainly. Charles Girard, at Charleston, South Carolina, in 1851, and at various other localities from 1848 to 1858. Professor Theo. Gill, at Beaufort, North Carolina, the West Indies, and Newfoundland, during 1859–'60. Dr. J. G. Cooper, in South Florida, in 1859. Dr. J. B. Holder, at the Tortugas, Florida, in 1860. Mr. S. T. Walker, Florida, 1879; and Mr. Henry Hemphill, Florida, 1882–'83. In 1882, Mr. Winifred Stearns, of Amherst, Massachusetts, in company with several college students, made a collecting tour to Labrador, which was productive of good results, especially in the line of marine invertebrates.

Explorations on the Pacific coast: Mr. E. Samuels, in 1855, under the auspices of the Smithsonian Institution and the Boston Society of Natural History, made large collections in California, and, in 1858, Mr. A. S. Taylor, collected at Monterey, in the same State. Mr. J. G. Swan, at Puget Sound, from 1860 to date; collections of all characters, including marine animals. Dr. C. A. Canfield, at Monterey, and other localities in California, from 1860 to 1867. Rev. Joseph Rowell, Dr. W. O. Ayres, and Professor R. E. C. Stearns; large collections of shells from the Pacific coast. Mr. Henry Hemphill; numerous collections of marine invertebrates from California, 1874 to date.

Interior of the United States: Explorations of Arizona, Indian Territory, the Southern States, etc., by Dr. Edward Palmer, from 1866 to date, mainly for ethnological materials, but also with good results in the way of aquatic animals. Collections of fishes from Pennsylvania by Dr. T. H. Bean, since 1874.

State Surveys.—State organizations, either as natural history surveys or fishery commissions, have accomplished a great deal in the way of making known the aquatic fauna of their territories. Among the first of the States to undertake purely scientific explorations in this direction were Massachusetts and New York, both of which States have published standard works upon the subject. A large majority of the States have since done more or less good work in the same line. Nearly every State now has its fishery commission, the specific object of which is the protection or propagation of food fishes, but some of these have also rendered generous assistance in the line of pure science.

Illinois has a central zoological station at Normal, under the charge of Professor S. A.

Forbes, to which are referred all zoological problems of interest to the State. In connection with his other duties, Professor Forbes has conducted careful zoological surveys of many of the lakes and rivers of the State, including the southern part of Lake Michigan.

In this connection, reference might also be made to private fishing clubs and to amateur and professional fishermen, who are making constant contributions regarding the habits and distribution of fish.

ALASKA.

Western Union Telegraph Expedition.—This expedition to ascertain and survey the most feasible route for a line of telegraph from the United States to Bering Straits, in Alaska, thence to connect with a similar line through Siberia to Russia, although without practical issue so far as the construction of a telegraph line was concerned, gave excellent scientific results, and afforded the means of studying the fauna and flora of a previously unexplored region. The party was organized on a military basis, with Captain Charles S. Buckley, engineer in chief; Captain Charles M. Scammon, chief of marine; and Mr. Robert Kennicott, chief of the scientific corps. A steamer and four sailing vessels were at their disposal. The scientific corps consisted of the following members, in addition to the chief: William H. Dall, H. M. Bannister, Ferd. Bischoff, H. W. Elliott, J. T. Rothrock, and Charles Pease. They left New York for San Francisco in April, 1865, by way of the Isthmus of Nicaragua, and spent some three weeks at the latter place making collections. Arriving at San Francisco in May, Messrs. Bannister, Elliott, and Rothrock soon left for British Columbia, while the rest of the party remained until the middle of July, studying the fauna and making extensive collections. In July, Mr. Kennicott, with the balance of his party, sailed for Alaska, touching at Vancouver's Island on the way. He visited Sitka, the Shumagin Islands, and Saint Michael's, establishing himself at the latter place for a prolonged series of explorations. In the meantime Mr. Dall, with the main party, proceeded to Plover Bay, Eastern Siberia, and thence to Petropavlovsk, Kamschatka, returning to San Francisco in November, 1865. Several weeks of January, 1866, were spent by Mr. Dall at Monterey, California, in zoological collecting, but in July of the same year he returned to Saint Michael's, Alaska, by way of Plover Bay, arriving at the former place in September, only to find that Mr. Kennicott had died several months before. The direction of the survey thenceforward devolved upon Mr. Dall, who remained in the country more than two years longer.

The winter of 1866–'67 was spent at Nulato, and in the spring of 1867 Mr. Dall started up the Yukon River for Fort Yukon, returning again down the river to its mouth, and thence going by sea to Saint Michael's. Here ended the explorations in the interest of the telegraph company, but Mr. Dall continued his natural history observations and collecting at his own expense. His field of operations was much the same as during the previous year, the winter being spent at Nulato, and the descent of the Yukon commenced in the spring. The better part of the collecting season was spent in the Yukon Delta, after which Mr. Dall returned to San Francisco by way of Saint Michael's and the Pribiloff and Aleutian Islands. The collections obtained by the telegraph expedition and Mr. Dall consisted principally of birds and mammals, but also included a full series of all the fishes then known to inhabit the Yukon River, and many marine fishes and invertebrates from the various localities visited. The expenses of the original collecting outfit were shared conjointly by the Smithsonian Institution and the Chicago Academy of Sciences, but after the abandonment of the expedition Mr. Dall received no outside aid.

United States Coast Survey.—In 1871, Mr. William H. Dall began a second series of explorations of Alaskan waters, under the auspices of the Coast Survey, as an assistant of that survey, and although the collecting of zoological specimens was incidental to the primary objects of the explorations, an immense amount of natural history material has already been obtained and in large part described. The first cruise,

made with the Coast Survey schooner "Humboldt," included the region of the Aleutian Islands, from Unalashka eastward, and was continued from August, 1871, to September, 1872. The second cruise, with the Coast Survey schooner "Yukon," in 1873, embraced the western half of the same group of islands. In 1874 the schooner "Yukon" first proceeded to Sitka, and thence followed along the coast as far as Unalashka. From this place it visited the Pribiloff Islands and Nunivak Island, and thence skirted the Alaskan coast southward to the point of departure.

In April, 1880, Mr. Dall, accompanied by Dr. Tarleton H. Bean, of the United States National Museum, left San Francisco for Alaska by the regular passenger steamer, and joined the schooner "Yukon" at Sitka. The course taken this year agreed in part with that of 1874, but many additional places were visited and the explorations were extended to the Siberian coast and to Point Belcher, in the Arctic Ocean. Collections were principally obtained from the following localities: Sitka, Port Althorp, Port Mulgrave, Cook's Inlet, Kodiak, Shumagin Islands, Belkoffsky, Unalashka, Saint Paul's Island, Plover Bay (Siberia), Cape Lisburne, Icy Cape, Point Belcher, Eschscholtz Bay, Port Clarence, Big Dromide Island, and Saint Mathew's Island.

Aside from the regular surveying work, most attention was paid to collecting marine animals of all kinds, and fresh-water fishes. The dredge was in constant use, and much valuable material and data were also obtained from the natives. Dr. Bean, as the guest of the Coast Survey, was enabled to devote his entire time to natural history investigations, and made the trip mainly for the purpose of studying the fish fauna of Alaska, from both a scientific and practical standpoint.

All of the Alaskan collections of natural history made by the Coast Survey are now safely housed at the National Museum in Washington. Mr. Dall, in an official report, states, regarding them, that "our collection of natural history is very valuable and contains more material for the determination of geographical distribution and specific development than has ever been sent from the west coast before."

Tidal observers in Alaska who have made valuable collections of marine animals have been Mr. W. J. Fisher, stationed at Kodiak, and Mr. McKay, stationed at Fort Alexander, Bristol Bay.

Treasury Department.—Mr. Henry W. Elliott, as an agent of this Department, visited the Fur Seal Islands, Alaska—Saint Paul, and Saint George—in 1872-'73, and made many large collections of marine fishes and cetaceans, and many sketches illustrative of the habits of seals and the seal fisheries. The revenue cutters "Corwin," Captain Hooper, and "Richard Rush," stationed in Alaskan waters, have both rendered efficient service in the field of marine zoology.

Signal Service Bureau of the War Department.—Much valuable aid has been rendered zoological science in this important section of the War Department by observers stationed in Alaska and the northern portion of Eastern North America. In making appointments for these distant stations, the Signal Service Bureau has generally accepted candidates recommended by the Smithsonian Institution, who are especially qualified to carry on zoological investigations in addition to their other observations. These observers have already made very extensive contributions in all departments of natural history, among which the marine animals are prominently represented.

Mr. Lucien M. Turner was stationed at Saint Michael's, Norton's Sound, Alaska, from 1874 to 1877, and in 1879 went to the Aleutian Islands, where he had charge of several temporary stations at different localities besides the main station at Sitka. In journeying from place to place, he was able to bring together a vast amount of material, all of which has been received at Washington in good condition. In 1882, Mr. Turner was transferred to a new station at Fort Chimo, Ungava Bay, Northern Labrador, where he now is, fully equipped for all kinds of collecting.

Mr. E. W. Nelson replaced Mr. Turner at the Saint Michael's station, where he remained, doing the same class of work for about four years. At the close of this service, he made a trip in the revenue cutter "Corwin," to Wrangel Land, in the Arctic Ocean, touching at various interesting points in Bering Sea, and returning to the

United States in the winter of 1881–'82. Mr. Nelson's collections are of the same character as those of Mr. Turner, and are very extensive.

In 1881 a party of observers, under Lieutenant Ray, United States Army, and including two trained naturalists and collectors, Mr. John Murdoch and Mr. Smith, were sent by the Signal Service Bureau to Point Barrow, Alaska, in the Arctic Ocean, one of the series of international signal stations, where they still remain. They were visited in 1882 by a relief party, which brought back from there an interesting collection of aquatic animals and ethnological specimens, and still larger collections are promised for this year.

Smithsonian Institution.—The Alaska Commercial Company, through its officers and agents in San Francisco and Alaska, has not only rendered every possible aid to Alaskan explorations, on behalf of the Smithsonian Institution, but has also made many valuable contributions in zoology, especially with reference to the seals and seal fisheries. From Mr. Henry Elliott, an agent of the company, especially valuable specimens, drawings, and observations, mainly illustrative of the habits of seals, have been received.

In 1871, Captain Charles Bryant, in charge of the Fur Seal Islands, sent to Washington a very large collection of the skeletons, skulls, and skins of seals and walruses.

Mr. Leonhard Stejneger is now making a zoological survey of Bering Island, on the coast of Kamtschatka, from which place he has already sent the skulls of two interesting ziphioid whales, and a large collection of bones of the extinct *Rhytina*, or Arctic sea-cow.

FOREIGN.

Navy Department.—The United States Navy lays claim to two of the most important oceanic expeditions of the world, in which the study of aquatic life formed essential features—the Wilkes Expedition of 1838–'42, and the North Pacific Exploring Expedition of 1853–'56. In addition to these, there have been numerous smaller surveys by the same service, which have yielded good results in the same line, and many naval officers have been constant contributors to the National Museum from all quarters of the globe. A more important sphere of usefulness, however, for its bearing upon aquatic life, as well as upon hydrography, has probably been that of deep-sea sounding, in which the United States Navy has always taken a prominent stand. A full account of its achievements in this direction would be impossible here, and we can only refer to the more important steps taken in the improvement of sounding methods. We may, perhaps, be pardoned for quoting in this connection the following paragraph from a recent paper by Captain George E. Belknap, United States Navy, as a deserved tribute to this service as well as to the originator of the present method of using steel wire for sounding.

"The impartial student, whether American or European, will accord to the United States naval service and Coast Survey merited prominence in diligent and persistent effort, inventive appliance, and intelligent adaptation of ideas and methods, from whatever source, towards the satisfactory solution of the problem [of deep-sea sounding]; but it was the good fortune of Sir William Thomson, of Glasgow University, to conceive the best and simplest means of measuring the depths; and to-day, thanks to his genius, it is as easy for the questioning seaman or scientist to bring back answer from the depth of five miles as it formerly was from a quarter of a mile."

The earliest use of wire for sounding purposes, of which we can find mention, was made by the Wilkes United States Exploring Expedition, between 1838 and 1842, on which most of the vessels were supplied with copper wire, about three thirty-seconds of an inch in diameter, and spliced together by means of twisted ends, covered over with solder. The experiments were unsatisfactory, owing to the frequent parting of the wire, and were finally abandoned. The second trial with wire appears to have been made in August, 1849, by Captain Barnett, of H. M. S. "Thunderer," between the Banks of Newfoundland and the Western Islands. The wire was of iron, varying in size from No. 1 to 5, and was wound on a small reel, the sinker used weighing 61

pounds. No restraint was apparently put upon the reel, and the wire broke at two thousand fathoms on the first sounding, which seems to have been the only one attempted.

Three months later, the same year, Lieutenant J. C. Walsh, United States Navy, in the United States schooner "Taney," attempted sounding with English steel wire of Nos. 5, 7, and 8, Birmingham gauge, to the eastward of Bermuda. "The wire was wound on an iron reel (holding about 7,000 fathoms), fitted with brakes or friction bands for its better control in working, and swivels were fitted next the sinker, and at every thousand fathoms, to counteract the tendency to twist. The lengths were marked with copper labels, and the sinker weighed only 10 pounds; but 6 pounds may be added for the weight of the registering machine devised by Maury and used on this occasion." The wire seems to have been of too large a size, the splices too imperfect, and the sinkers too light for the purpose, and the several experiments made were all unsuccessful. On the first trial, some 5,700 fathoms of wire were run out without an indication of bottom, although the depth must have been less than half that distance, when the wire parted near the surface, it was supposed from a defective splice. In the other trials made, the wire generally broke at depths of about 2,000 fathoms, or above the bottom.

We have no further records of the attempted use of wire for sounding from this time until Sir William Thomson began his experiments, in 1872, on the principle that "the art of deep-sea sounding is to put such a resistance on the reel as shall secure that at the moment the weight reaches bottom the reel will stop." A description of the Thomson machine is given in the descriptive catalogue which follows, and need not be repeated here. Thomson made the first trials with his machine in the Bay of Biscay, in 1872, from the schooner-yacht "Lalla Rookh," and although the reel proved too weak to withstand the strain put upon it by the wire in reeling in, the first sounding was accurate. The English Navy, however, declined to use the machine until it could be perfected, a work that has since been successfully accomplished by the naval service of this country. Commodore Ammen, United States Navy, then chief of the Bureau of Navigation, ordered one of the new machines from Thomson as soon as he heard of its successful trial, intending to have it used by the U. S. S. "Juniata," in a line of soundings from New York to Bermuda, in 1873. This project was abandoned, however, and the entire outfit transferred to the U. S. S. "Tuscarora," which received an equipment at San Francisco, in the summer of 1873, for a series of soundings across the Pacific Ocean, between the United States and Japan, "for scientific purposes, and for the purpose of determining the practicability of laying a telegraph cable between those points." Captain George E. Belknap, United States Navy, was in command of the "Tuscarora," and to his skillful management was due the first successful line of deep-sea sonndings with piano wire. The equipment of the ship was completed in August, 1873, and she at once proceeded to test her appliances a short distance off San Francisco, making successful soundings in depths of 830 to 1,949 fathoms. The only important defect discovered was as to the strength of the reel, which soon showed signs of weakening and had to be strengthened; a new and larger reel of extra strength was also constructed. Later on, several other minor alterations and improvements, suggested by experience, were introduced in the machine. The original plan was to run the line of soundings from Cape Flattery to Yokohama, Japan, by way of the Aleutian Islands, Alaska, and a beginn ng was at once made off the first mentioned point. Twenty-five casts were taken in depths down to 2,534 fathoms, before the approach of winter rendered it necessary to discontinue operations until the next year, but in returning to San Francisco a line of 83 casts in like depths of water was successfully completed. In January, 1874, the "Tuscarora" sailed from San Diego, California, on a new route across the Pacific Ocean, via the Hawaiian and Bonin Groups. Twenty-seven days were consumed in making 62 casts, from San Diego to Honolulu, in depths of 71 to 3,050 fathoms; 29 days from the latter group to the Bonin Islands, with 59 casts in depths down to 3,287

fathoms; and 4 days from the Bonin Islands to Yokohama, during which 12 casts were made, the deepest in 2,435 fathoms. After a short delay at Yokohama, the "Tuscarora" proceeded to finish the northern line of soundings, via the Aleutian Islands and Cape Flattery, which occupied the time from June 9 to August 21. Very many casts were made, and exceedingly deep water (the deepest recorded from the Pacific or any other ocean) was encountered off the northeast coast of Japan, at only a comparatively short distance from land, very many of the soundings showing depths below 4,000 fathoms, the deepest being 4,655 fathoms. This cruise of the "Tuscarora" was one of the most, if not the most, remarkable one ever undertaken for sounding purposes, and demonstrated to the fullest extent the superior advantages of steel wire, when rightly applied, over any kind of rope or twine for taking deep-sea soundings. The advantages gained are greater rapidity in working and greater accuracy of results, while the diminished space required for the storage of the wire and machine is also a matter of grave consideration.

Since the successful cruise of Captain Belknap, the Thomson principle of sounding with wire has been universally adopted for all deep-sea sounding operations by the United States Navy and Coast Survey. In connection with his soundings, Captain Belknap made a continuous series of oceanic temperature observations at the bottom and surface, with Miller-Casella thermometers, and obtained abundant specimens of the bottom by means of an improved sounding rod of his own invention (described in the catalogue), and also many samples of water for analysis.

The "Tuscarora" returned to San Francisco on the anniversary of her departure from there to begin the northern line from Cape Flattery, and in the meantime she had traversed some 16,600 miles of ocean and made 483 casts by means of the sounding wire. Subsequently, under other commanders, the "Tuscarora" run a line of soundings from San Francisco to Honolulu, and another from Honolulu to Australia. Still later the same kind of apparatus was used by the U. S. S. "Narragansett," in the Gulf of California; by the "Gettysburg" in the North Atlantic and Mediterranean; by the "Alaska," en route around the Horn; and by the "Essex," in the South Atlantic. The "Gettysburg" obtained the deepest sounding but one yet recorded from the Atlantic Ocean (the deepest having been made by the "Challenger"); while the "Essex" has made the deepest known from the South Atlantic.

To turn from the subject of sounding wire to that of deep-sea leads or sinkers, it is evident that to the American Navy is due one of the most important inventions in that line also. In 1854, Passed-Midshipman (now Professor) J. M. Brooke, United States Navy, devised the detachable sinker, bearing his name, for use in considerable depths of water, and which is released the moment it touches bottom, relieving the strain on the rope, and permitting of the recovery of a sample of the bottom by means of a light iron rod which loosely perforates the sinker. The latter consists simply of a solid iron shot, of the desired weight, with a cylindrical hole through the center for holding the sounding rod, to the upper part of which it is securely slung on the passage downward. The sinkers still used by the United States Navy and Coast Survey in deep-sea work are of the Brooke pattern, but the sounding rods and the method of securing the shot have been greatly improved by Captain Belknap and Commander Sigsbee, in the manner described in the catalogue. Another ingenious detaching sinker, which has been used to some extent in the Navy, was invented by Lieutenant (now Rear-Admiral) Sands, United States Navy, in 1857, and one of the most common leads for recovery in use is furnished with a cup for obtaining bottom specimens, introduced by Lieutenant Stellwagen, of the same service.

Want of space, however, forbids our continuing this discussion of the sounding operations and methods of our Navy, which might be extended to cover many interesting explorations under both the old and new systems of work. Suffice it to say that this department of the service has always displayed the most liberal spirit in regard to zoological research, and has in many small as well as great ways contributed to our knowledge of the fauna of the oceans wherever its ships have gone. The bot-

tom specimens obtained by sounding have always been turned over to the United States National Museum, but only a few of these have yet been studied, for the want of funds. Other services by naval officers are referred to in connection with the Coast Survey. A full set of the hydrographic charts of the United States Navy, showing extent and character of explorations, are exhibited. The following are among the more important natural history surveys of this department.

The Wilkes Expedition.—The United States Exploring Expedition around the World, under the command of Captain (Admiral) Charles Wilkes, United States Navy, was one of the most successful expeditions for scientific purposes ever organized by any government. It left this country in 1838 and returned in 1842. The fleet consisted of six vessels, as follows: Sloop of war "Vincennes," flagship; sloop of war "Peacock," Captain W. L. Hudson; brig "Porpoise," Lieutenant Cadwalader Ringgold; storeship "Relief," Lieutenant A. K. Long; and the tenders "Sea Gull" and "Flying Fish." The scientific corps consisted of the following persons: Horatio Hale, philologist; Charles Pickering and T. R. Peale, naturalists; J. P. Couthouy, conchologist; James D. Dana, mineralogist; William Rich and J. D. Breckenridge, botanists; Joseph Drayton aud A. T. Agate, draughtsmen. Included in the general instructions to the commanding officer was the following paragraph relating to the scientific objects of the survey: "Although the primary object of the expedition is the promotion of the great interests of commerce and navigation, yet you will take all occasions, not incompatible with the great purposes of your undertaking, to extend the bounds of science and promote the acquisition of knowledge."

Leaving Norfolk, Virginia, August 18, 1838, the course lay southward through the Atlantic Ocean, via the Island of Madeira, Cape de Verde Islands, Rio de Janeiro, and the eastern coast of Southern South America, to Terra del Fuego; thence northward along the western coast of South America as far as Callao, and from there to the islands of the Central and South Pacific Ocean, Australia, and the west coast of the United States. The principal places visited in the Pacific Ocean region were the Paumotu Group, Society Islands, Samoan Group, Feejee Islands, Southeastern Australia, New Zealand, the icy barrier of the supposed Antarctic Continent, Kingsmill Islands, Sandwich Islands, and the coast of the United States, from San Francisco to Puget Sound. From the Pacific Ocean the expedition passed by way of the China Sea, Sooloo Sea, and the Straits of Sunda, into the Indian Ocean, making especially large collections at Singapore. From the Indian Ocean, the expedition returned home via the Cape of Good Hope. The collections made in the course of this long cruise embraced every branch of natural history and were exceptionally large. They formed the basis of the United States National Museum at the time of its foundation, and are still among its most interesting features. As many of the regions visited were previously unknown to civilization, the value of the scientific observations cannot be readily overestimated.

As regards marine explorations, most attention was paid to the study of the structure and formation of coral reefs and islands, and the coral, crustacean, molluscan, and fish faunæ. The publications, completed in 1858, comprise 24 volumes of text, mostly quartos, 13 atlases and 2 volumes of charts, covering all the geological, zoological and botanical results of the expedition, in addition to the regular surveying work. The zoophytes and crustacea were described by Professor James D. Dana, in three quarto volumes of text and two folio atlases; the mollusks by A. A. Gould, in one volume of text, and one atlas; the geographical distribution of species by Charles Pickering, in one volume.

In his official Smithsonian report, for 1858, Professor Baird remarks regarding the Wilkes expedition that "The collections made by this naval expedition are supposed greatly to exceed those of any other of similar character ever fitted out by a foreign government, no published series of results comparing at all in magnitude with that issued under the direction of the Joint Library Committee of Congress."

The North Pacific Exploring Expedition, as it is commonly called, has, next to the

earlier expedition under Wilkes, given more important zoological results than any similar explorations under the Navy Department. It sailed from the United States in June, 1853, and continued its work through 1854 and 1855, returning in 1856 The great value of its zoological results were due to the untiring zeal of its chief zoologist, Dr. William Stimpson, whose previous studies and explorations particularly fitted him for the position.

This expedition was carried on under an appropriation from Congress in 1852, for "building or purchase of suitable vessels, and for prosecuting a survey and reconnaissance, for naval and commercial purposes, of such parts of Bering Straits, of the North Pacific Ocean and the China seas, as are frequented by American whale-ships, and by trading vessels in their routes between the United States and China." The necessary vessels were procured and equipped in the most substantial manner, and fitted out with all the instruments required for making observations in astronomy, hydrography, magnetism, and meteorology, together with the most complete equipment of natural history apparatus which had ever been taken to sea up to that time. Captain C. Ringgold, who had formerly been connected with the United States exploring expedition under Captain Wilkes, was placed in command; but, being recalled to the United States in 1854, he was superseded by Captain John Rodgers. The squadron was organized as follows: Sloop "Vincennes," bearing the flag of Commander Ringgold; Lieutenant Rolando, commanding and executive officer; Lieutenant J. M. Brooke, assistant astronomer; William Stimpson, zoologist to the expedition; F. H. Storer, chemist and taxidermist; Edward M. Kern, photographer and artist. Steamer "John Hancock," Lieutenant John Rodgers commanding; Charles Wright, botanist to the expedition; A. H. Ames, assistant naturalist. Brig "Porpoise," Lieutenant Alonzo B. Davis commanding; schooner "Fennimore Cooper," Acting Lieutenant H. R. Stevens commanding; storeship "John P. Kennedy," Lieutenant Napoleon Collins commanding.

The vessels left Norfolk in June, 1853, and, after touching at the island of Madeira, proceeded to Hong-Kong, China, via the Cape of Good Hope. On this passage, the sloop "Vincennes" and the brig "Porpoise" passed by the way of Van Diemen's Land, through the Coral Seas, and by the Caroline, Ladrone, and Bashee islands; and the steamer "John Hancock," the store-ship, and the tender by the way of the straits of Sunda and Gaspar, the Carimata and Billeton passages, and the Sooloo Sea. The existence of a civil war in China at the time of the arrival of the expedition at Hong-Kong occasioned some delay in the progress of the exploring work, which was again resumed in the latter part of 1854. Subsequently the expedition proceeded northward, continuing the observations and collecting along the coasts of Japan, and Kamtschatka, in Bering Straits, on the coast of California, and at Tahiti, from which latter place it returned directly home by way of the Cape of Good Hope. The natural history results were of great magnitude, filling many boxes and barrels, and embracing very many new and rare species. The extent and value of the zoological collections may be judged from the following table of the number of species of each group obtained:

	Species.
Vertebrates	846
Insects	400
Crustacea	980
Annelids	220
Mollusks	2,359
Radiates	406
Total	5,211

The plants in their original packages occupied a bulk of over 100 cubic feet.

Soon after his return to the United States, Dr. William Stimpson became the director of the Chicago Academy of Science, to which place nearly all the invertebrate materials of the expedition were transferred. Considerable progress had been made

in working up results, and several short papers briefly descriptive of the more interesting groups of animals had been issued, when the memorable conflagration of 1871, which destroyed so large a part of Chicago, completely annihilated the entire collection there, as well as all the MSS. and drawings which had been prepared for publication. The only collections of marine invertebrates which escaped were the corals and a few of the Crustacea, which had been left for study at the Smithsonian Institution, the Museum of Comparative Zoology, and Yale College.

Surveys of lesser magnitude under the Navy Deparment have been the exploration of the River Amazon and its tributaries, in 1852, by Lieutenant W. L. Herndon, during which a very large collection of fresh-water fishes was made. The astronomical expedition to Chili, from 1849 to 1852, by Lieutenant J. M. Gilliss; interesting collections of marine animals. Explorations of the La Plata and its tribntaries, from 1854 to 1857, by the U. S. S. "Waterwitch," Captain T. J. Page. Although unaccompanied by a naturalist, Captain Page sent to Washington a very extensive collection of the fishes of this extensive river system.

Survey of the islands of the North Pacific Ocean, in 1873–'74, by the U. S. S. "Portsmouth," Drs. T. H. Streets and W. H. Jones, surgeons and naturalists. Survey of the coast of the Peninsula of Lower California, on both the ocean and gulf sides, by the U. S. S. "Narragansett," Dr. William Evers, surgeon and naturalist. On each of these expeditions large numbers of marine invertebrates and fishes were obtained.

The Polaris Expedition to the Arctic Ocean during 1871 and 1872, under Captain Charles F. Hall, Dr. Emil Bessels, chief of the scientific department. This ill-fated expedition was fitted out by the Navy Department, pursuant to an act of Congress, and sailed from the United States in the summer of 1871. It reached the latitude of 82° 16′ N., the most northern point attained by civilized man up to that time. During the winter of 1871 and 1872, and the following spring, very large collections of marine animals, mainly invertebrates, were made and preserved, but on account of their bulk they had to be left on board the steamer and were lost with her.

Archæological explorations of Dr. J. F. Bransford, United States Navy, in Nicaragua, in 1873, 1876, and 1877, and in Panama in 1875, during which many interesting species of fresh-water and marine fishes and invertebrates were collected.

Transit of Venus Expedition of 1874–'75. Dr. J. H. Kidder, United States Navy, acted as naturalist of the party landed on Kerguelen Island, by the U. S. S. "Swatara," and devoted his entire time to zoological investigations, making large collections of marine animals. Dr. E. Kershner, United States Navy, surgeon of the "Swatara," on this same cruise, added to Dr. Kidder's resnlts many interesting specimens of marine invertebrates from various sources in the South Pacific, and Mr. Israel Russell, photographer of the New Zealand party, collected extensively at that island.

In 1876, Engineer W. A. Mintzer, United States Navy, made interesting collections of marine fishes and invertebrates from the Arctic Ocean, north of Hudson's Straits.

The steamer "Jeannette," under Lieutenant De Long, fitted out by Mr. James Gordon Bennett and the Navy Department, for a cruise through the Arctic Ocean, from the Pacific westward to the Atlantic, was fully equipped for natural history investigations, and up to the time of her abandonment and destruction very large and valuable collections of marine animals and many interesting notes had been made by the naturalist on board, Mr. Raymond L. Newcomb.

In 1881 the U. S. S. "Alliance" visited the region about Spitzbergen, in the Arctic Ocean, in a search for the Jeannette, on the supposition that she had safely traversed the ocean north of Asia, in her westerly course, and, although unsuccessful in the search, she succeeded in making numerous successful dredgings in moderate depths of water off the island of Spitzbergen. The collection sent home was quite large and in good condition; it consisted of marine invertebrates and also of fresh-water fishes. About the same time the steam whaler "Rogers," purchased by the Government, and officered and manned by the Navy, started up on the west side, via Bering Straits, for

the same purpose, and with a complete collecting outfit. While wintering in the Arctic Ocean, to the westward of Bering Straits, she accidentally took fire and was totally destroyed, together with a fine collection of marine animals, which had been made by the surgeon on board.

Captain L. A. Beardslee, whose previous connection with the United States Fish Commission had given him an interest in zoological matters, while in command of the sloop of war "Jamestown," in Alaskan waters, from 1879 to 1881, made many interesting observations regarding the marine fauna of that region, and sent valuable collections to Washington.

On the Palos Expedition to Japan and China, under Commander Green, United States Navy, during 1881 and 1882, for astronomical purposes, complete arrangements were made for marine collecting, a very full equipment for that purpose being furnished by the Smithsonian Institution. Dr. F. C. Dale, United States Navy, acted as surgeon and naturalist, and was assisted by Mr. P. L. Jouy, of the United States National Museum. Numerous, very large, and finely-preserved collections of fishes and invertebrates were received from this party from time to time, and they include many interesting species. Neither of the naturalists have yet returned to Washington, and Mr. Jouy is still in Japan, continuing his work independent of the ship.

State Department.—The Japan Expedition of 1853–'55, under Commodore M. C. Perry, United States Navy, to form a treaty with Japan, was sent out in the combined interests of the State and Navy Departments. Natural history collecting was incidental, but much was accomplished in that line.

Many valuable collections of marine invertebrates and fishes have been obtained through consuls and special agents of the State Department, who have been favorably located for such work. Among these may be mentioned Captain Nicholas Pike, consul at the Mauritius Islands, and Colonel A. B. Steinberger, special agent at the Samoan Islands, both of whom have sent to Washington very large and interesting collections.

War Department, Signal Service Bureau.—An observing party, under Lieutenant Greely, United States Army, went to Lady Franklin Bay, Greenland, in 1881, where it is now stationed. No information has been received from this party since the return of the steamer which took it out. Dr. Pavy is the naturalist, and is fully equipped for natural history work. In preparation for this station, a preliminary expedition, called the Howgate Expedition, with Mr. Ludwig Kumlien as naturalist, was sent into the same region in 1877–'78. It visited the shores of Cumberland Gulf and the western coast of Greenland, and obtained many interesting zoological results. Mr. Lucien M. Turner, who was formerly stationed in Alaska, is now at Fort Chimo, Ungava Bay, Northern Labrador, where he expects to devote much time to marine zoology.

Smithsonian Institution.—In 1853, Dr. E. K. Kane, who had been the surgeon of the Grinnell expedition of 1850, went again into the Arctic regions in command of the same brig, Advance, to renew the search for Sir William Franklin. Mr. Henry Goodfellow was naturalist of the expedition, and obtained very large collections, which, however, had to be abandoned. The expenses of this voyage were paid by Mr. Henry Grinnell and Mr. George Peabody, and it was sent out under the joint auspices of the Geographical Society of New York and the Smithsonian Institution.

Since 1858, Captain J. M. Dow, of the Pacific Mail Steamship Line, has made frequent contributions of fishes and marine invertebrates to the National Museum from the west coast of Central America and the Isthmus of Panama. From 1864 to 1866, Dr. A. Schott, as naturalist of the scientific survey of Yucatan, in the interest of the government of Yucatan, sent considerable material of value to Washington.

From 1868 to 1870, Professor F. E. Sumichrast made a thorough natural history exploration of the Isthmus of Tehuantepec, with his expenses partly paid by the Kentucky University, the Boston Society of Natural History, and the Philadelphia Academy of Natural Sciences. According to an official report of the Smithsonian Instit-

tion, "his series of specimens (including many fishes from the west coast) was very complete, and is believed to express essentially the zoological character of an interesting section of Mexico." In 1872, Mr. William Gabb made a natural history survey of San Domingo, and from 1873 to 1875, a similar one of Costa Rica, obtaining valuable contributions for the Smithsonian Institution.

MUSEUMS AND SOCIETIES OF NATURAL HISTORY.

The Museum of Comparative Zoology of Harvard College.—This extensive museum, established in 1859 by Professor Louis Agassiz, has always exerted a most important influence on scientific investigations in every department of natural history. Through the liberal donations of many public-spirited men, and with occasional assistance from the State of Massachusetts, it has been enabled to accomplish far greater results than any other similar institution in the country. Its good work has not been limited to the purchase of collections, a legitimate method of fostering scientific research indulged in by most museums, but it has organized and pushed to completion many important explorations in different parts of the world, and claims a large share of the success attending the recent deep-sea dredging and trawling operations of the United States Coast Survey. Not least among its good offices has been the careful training of naturalists, and a considerable proportion of those who now stand prominent in the department of marine research received their first practical instructions from the late Professor Agassiz. The policy of the museum has ever been most liberal, and lavish sums of money have been expended wherever the prospects of good results would warrant it. Notwithstanding the fact that no department of zoology has been neglected, investigations regarding recent aquatic life have successfully competed for a lion's share of patronage, and the published results of the museum in this line are extremely flattering. Professor Louis Agassiz died in the winter of 1873–'74 and was succeeded in the directorship of the museum by his son, Professor Alexander Agassiz.

When the museum was first organized, the marine fauna of the New England coast was but imperfectly known, and Professor Agassiz and the museum assistants and students of marine zoology spent much of their time during the summer months in making collections and observations along the sea-coast. Similar operations were extended to the interior lakes and rivers, to the west coast of North America, and to foreign countries. The summer home of Professor Agassiz was at Nahant, Massachusetts, where he enjoyed superior advantages for the study of marine life, and especially of the Medusæ. His observations at this place were continued from year to year during his life, and afforded abundant results for publication. Before the establishment of the museum, however, Professor Agassiz had commenced his researches on the Atlantic coast. The summer of 1847 was spent on Nantucket Shoals, in connection with the surveys under Captain Davis, U. S. N., Mr. Desor also participating in the dredging work. Later, Professor Agassiz visited Charleston, S. C., and the coast of Florida, where he made large collections during a period of three or four years. Doctor G. Wurdemann and Mr. James E. Mills also collected extensively for Professor Agassiz at the latter place, and Dr. Weinland, on the coast of Cuba.

In 1859, Mr. A. E. Verrill began his explorations of the New England coast, which were carried on in connection with the museum until 1864, when he joined the faculty of Yale College. The summer of 1859 was spent at Eastport, Maine, and that of 1860 at Mount Desert, in company with A. Hyatt and N. S. Shaler. The same year, Mr. Alexander Agassiz, then attached to the U. S. Coast Survey, and Mr. T. G. Carey commenced their series of collectings on the West Coast of North America, which were continued for several years. Mr. Carey's contributions were mainly from the vicinity of San Francisco, but those of Mr. Agassiz were obtained at numerous places between the Gulf of Georgia and Mexico. Mr. Alpheus Hyatt, in 1860, made extensive collections of fresh-water mollusks and other invertebrates from the rivers of Kentucky, mainly for the purpose of identifying the species of *Unionidæ*, previously described from that region by Rafinesque. Mr. W. H. A. Putnam, captain of one of the large

merchant ships sailing from Boston, was one of the most faithful volunteer collectors in the service of the museum, and during his many voyages, especially to the west coast of South America and the South Pacific islands, he obtained most valuable contributions to science, which were always added to the museum collections.

From 1861 to 1863, Mr. Caleb Cook, a student of the museum, was stationed at Zanzibar, on the coast of Africa, where he made a large collection of animals, both terrestrial and aquatic. In 1861, a museum party, consisting of A. E. Verrill, Alpheus Hyatt, and N. S. Shaler, spent the summer at the Island of Anticosti, in the Gulf of Saint Lawrence, and, although they were mainly interested in the land animals and plants and in geological problems, their contributions to marine zoology were very important. Dredgings were made along the coast of Nova Scotia, in the Gulf of Saint Lawrence, and along the southern coast of Labrador. Mr. A. S. Bickmore visited the island of Bermuda the same year, and explored its marine fauna, with interesting results.

During 1865–'66, the memorable Thayer expedition to Brazil took place. This expedition was rendered possible through the munificence of Mr. Nathaniel Thayer, of Boston, one of the most constant and generous contributors to the museum fund, and in every way proved a complete success. The party was in charge of Professor Agassiz, and consisted of a large corps of associates and assistants, many of whom were volunteers. In reporting upon the results of his expedition, Professor Agassiz states: "One of my principal objects during the whole journey was to secure accurate information concerning the geographical distribution of the aquatic animals throughout the regions we visited. Allowed to take with me a corps of six assistants already trained in the work of the museum, and our party being also strengthened by the addition of six volunteer assistants, I was able to lay out a scheme for a thorough exploration of large tracts of country in Brazil, parts of which had not yet been visited by zoologists." These explorations extended along the entire sea-coast, from Para to San Paulo, and included all the principal rivers and many of their tributaries. Much assistance was rendered by the Emperor of Brazil, in the way of vessels, boats, and men. The alcoholic collections received at Cambridge from the expedition filled nearly 400 kegs and barrels, and in addition there were many cases of dried specimens. In the official report of the museum for 1866 the following statement occurs regarding the extent of the collections: "An idea of the magnitude of our new stores can be formed from the fact that in the class of fishes alone no less than 50,000 specimens were counted, representing over 2,200 species, the majority of which, say 2,000, are probably new to science and to our collections. This estimate does not include the smaller specimens, less than two inches in length, which also number many thousands."

In May, 1867, began the first series of deep-sea dredgings off the coast of Florida by the United States Coast Survey, in which Count L. F. de Pourtales took charge of the dredging operations. Count Pourtales was then an assistant on the Coast Survey, but later became an assistant of the museum, and the collections he obtained were mainly worked up by himself or under his direction. From this period dates the intimate connection of the Museum of Comparative Zoology with the Coast Survey, in nearly all matters relating to deep-sea investigations of zoology on the Atlantic coast, a connection that was undoubtedly strengthened by the warm personal friendship existing between Professor Louis Agassiz and Professor Peirce, then Superintendent of the Coast Survey. The full discussion of these explorations is given in connection with the work of the Coast Survey, and we need but briefly refer to them here.

The Hassler Expedition, during 1871–'72, in which Professor Louis Agassiz participated, obtained important results. With reference to the causes which led to it, Professor Agassiz wrote, in 1872, as follows:

"About two years ago, Professor Peirce, Superintendent of the United States Coast Survey, found it necessary to build a vessel especially for the work of the survey on the Pacific Coast. When she was nearly ready for sea, it occurred to the superintendent that it was a pity to send her empty around the continent, the more so since a great part of

her track would be especially interesting for scientific research. He proposed to me to join the vessel with some assistants, and to make such explorations as might not interfere with the progress of the voyage and with the regular work of the survey. At the same time he appointed Count de Pourtales, whose dredgings in the Gulf of Mexico have had such valuable results for science, to take charge of the dredging operations for the whole voyage."

The expenses of the scientific party, consisting of Professor Agassiz, Count Pourtales, Dr. Steindachner, and Mr. J. H. Blake, were entirely paid by private subscriptions from patrons of the museum. The course of the expedition was southward along the Atlantic coast and northward along the Pacific coast of America, to San Francisco, California. Dredgings were made at intervals, and numerous collections were obtained from the surface and from the shore, wherever the vessel touched.

In 1877 began the interesting series of explorations by the Coast Survey steamer Blake, under Commanders Sigsbee and Bartlett, in which Mr. Alexander Agassiz, assisted by Mr. S. W. Garman, had the direction of the natural history operations. The cost of the collecting outfit was entirely defrayed by Mr. Agassiz. During the several cruises, which terminated in 1880, the methods of deep-sea dredging were entirely revolutionized, mainly through the suggestions of Mr. Agassiz, who was the first to recommend the use of iron wire dredge rope.

During March and April, 1881, under the same auspices, Mr. A. Agassiz, assisted by Mr. J. Walter Fewkes, explored the Tortugas, Florida. It had been Mr. Agassiz's intention, by means of a small steam launch placed at his disposal, "to explore the surface fauna of the Gulf Stream, and ascertain the part taken by the innumerable surface organisms in building up the base (plateau) upon which the coral reefs of Florida have been raised." Stormy weather, unfortunately, greatly interfered with this undertaking, but many good results were obtained.

Dr. G. A. Maack, an assistant in the museum, as naturalist and geologist of the United States Darien Exploring Expedition, during 1870–'71, made large collections of shells, in addition to his other work.

In this connection may be mentioned the conchological studies of Mr. John Anthony, an assistant of the museum, which date back to before 1840. By his own dilligent labors he had amassed an exceedingly large collection of shells, mainly from the fresh waters of the United States, which are now in the possession of the museum.

In 1873, the Penikese summer school of natural history was established under the auspices of the museum, through a liberal gift of Mr. Anderson, of New York. The Island of Penikese, on which the school was located, is situated at the mouth of Buzzard's Bay, on the east side, in a region moderately rich in marine life. Although the primary object of the school was the instruction of teachers in natural history subjects, some original investigations were carried on. Soon after the death of Professor Louis Agassiz, however, the school was discontinued.

In 1875, Mr. Alexander Agassiz, accompanied by Mr. S. W. Garman, visited various portions of the west coast of South America, from Valparaiso to Lima, mainly for the purpose of making zoological collections. The principal object of the explorations was the investigation of the fauna of the high plateau, on which Lake Titicaca is located. The lake was dredged to a depth of 154 fathoms and many temperature observations were taken. The fauna of the lake was found to be very meager, but the paucity of life was to a large extent explained by the observations made.

In 1877, Mr. Alexander Agassiz built, at Newport, Rhode Island, one of the most favorable sites on the New England coast, a sea-side zoological laboratory, for his own use and that of advanced students in biology from the museum and the public schools of the State of Massachusetts. While the accommodations are sufficient for only about half a dozen students, they are very perfect and permit of the most delicate observations on living forms from the surrounding waters.

This laboratory is occupied every summer, and many valuable series of observations have already been carried on there and published. Concerning the motives which

prompted Mr. Agassiz to establish this laboratory, he says: "Ever since the closing of the school at Penikese, it has been my hope to replace, at least in a somewhat different direction, the work which might have been carried on there. It was impossible for me to establish a school on so large a scale; but I hope, by giving facilities each year to a few advanced students from the museum, and teachers in our public schools, to prepare, little by little, a small number of teachers, who will have had opportunities for pursuing their studies, hitherto unattainable."

The Portland Society of Natural History, Portland, Maine.—Local collections of marine zoology made by different parties, including Dr. J. W. Mighels, from 1840 to 1844, and Mr. C. B. Fuller in more recent years.

Essex Institute and Peabody Academy of Natural Science, Salem, Massachusetts.—The Essex Institute is an establishment of long standing, and, before the organization of the Peabody Academy, paid much attention to the study of local zoology. Dr. Henry Wheatland, one of its oldest officers, was also one of the earliest dredgers on the New England coast, his operations dating back to about 1838–'40. The Peabody Academy, which later absorbed the natural history section of the Essex Institute, has been one of the most active societies in the country in matters relating to marine zoology, and soon after it was started had the support of an able corps of workers, among whom may be mentioned Professors F. Putnam, A. S. Packard, jr., A. Hyatt, and E. S. Morse, Mr. J. H. Emerton, and Mr. Caleb Cook. Its work has been mainly limited to the New England coast, but its museum contains valuable collections of zoology from many parts of the world.

Boston Society of Natural History.—This is one of the oldest institutions of its character in the country, and with the liberal support accorded it has always been able to exert a favorable influence on scientific investigations, at home and abroad, both by the fitting out of collecting expeditions and the purchase of collections. We are unable to give anything like a complete list of the work accomplished under its auspices, and will only mention the names of a few aquatic zoologists, who, as members of the society, have been engaged in important investigations. Among the earlier members were the conchologists J. P. Couthouy and A. A. Gould, the former having been most actively engaged about 1836 to 1838 (and from 1838 to 1842, as a member of the scientific corps of the Wilkes Exploring Expedition), the latter from about 1838 to 1845. Dr. Gould, however, continued at work on important conchological reports, up to the time of his death, some twenty years later. Dr. W. O. Ayers made many collections of marine invertebrates and fishes from 1851–'53. and Dr. D H. Storer, the author of an important work on the fishes of Massachusetts, continued in active service from 1835 to 1867.

In more recent times, Professor Alpheus Hyatt, custodian of the society, has made many annual collecting trips to different parts of the New England coast, having been associated with the United States Fish Commission during several summers. In 1874, Dr. Edward Palmer made for the society the largest and finest collection of the horny sponges of the Bahamas and Florida ever brought to this country. The Labrador expedition of Dr. A. S. Packard, jr., in 1860, for the purpose of studying the marine fauna of Southern Labrador, in the vicinity of Caribou Islands, may also be mentioned here, as it was conducted partly under the auspices of this society, which received a large share of the collections made. The society's museum is very large, and contains many valuable type collections of aquatic animals.

The Lyceum of Natural History of New York.—Conchological researches of Amos Binney and W. G. Binney, Thomas Bland, Sanderson Smith, William Cooper, Temple Prime, and Charles M. Wheatly, and general marine invertebrates by James E. DeKay.

American Museum of Natural History, New York.—But few explorations have been undertaken by this museum, which has, however, accumulated by purchase and donation several valuable type collections, including the famous Jay collection of shells.

The Academy of Natural Sciences of Philadelphia is another institution to which the

same remarks made regarding the Boston Society of Natural History would apply, and its museum possesses many valuable types of aquatic animals. Many of its earlier members, one or two being still living, were pioneers in aquatic research in this country, and their works are now classical. Among these were Rafinesque, during the first part of the century; Thomas Say, the marine zoologist, about 1817–'22; C. A. Lesueur about 1816–'21; T. Conrad, the conchologist, from 1837–'68; Isaac Lea, the chief authority on North American *Uniondiæ*, and Dr. Joseph Leidy, who has collected and published extensively on marine invertebrates and Rhizopods.

The Elliott Society of Charleston, South Carolina, has counted among its active members Dr. L. Ravenel and Professor Lewis R. Gibbes, both of whom have made many contributions on marine zoology.

The Chicago Academy of Science, prior to the disastrous fire of 1871, by which it was seriously crippled, and lost its entire collections, had taken a prominent stand in marine and fresh-water researches, mainly through the active explorations of Dr. William Stimpson, whose exploits are described in other connections. Several winters were spent on the Florida Reefs by Dr. Stimpson, about 1870, in the sole interest of the society, and the same naturalist also explored Lake Michigan. More recently Dr. Velie has given much attention to the collecting of Florida fishes under the auspices of the society.

California Academy of Sciences, San Francisco.—Conchological researches and collections of Professor R. E. C. Stearns, and miscellaneous marine collections by William Gabb, W. N. Lockington, and W. G. W. Harford.

Private Collectors.—Among independent private collectors of note have been Colonel E. Jewett, who explored the coasts of Florida, Panama, California, etc.; Mr. James Lewis, fresh-water conchologist; and Mr. J. H. Linsley and Mr. J. H. Trumbull, who collected and published on the shells of Long Island Sound, about 1845.

COLLEGES.

Among the many colleges which have carried on aquatic explorations to a greater or less extent may be mentioned the following:

Bowdoin College, Maine.—Explorations in marine zoology on the western coast of Maine.

Williams College, Massachusetts.—Expedition to Labrador and Greenland in 1860, and to Florida, and expedition of Professor James Orton to the Amazonas and west coast of South America, in 1867.

Amherst College, Massachusetts.—Conchological researches of Professor C. B. Adams in Jamaica, other West India Islands, and Panama, and in the vicinity of New Bedford, Mass.

Brown University, Rhode Island.—Collections of Mr. J. W. P. Jenks; explorations of Professor A. S. Packard, jr., in connection with Government expeditions.

Yale College, Connecticut.—The early researches of Professor James D. Dana prior to 1838, and from 1838 to 1842, as naturalist on the Wilkes United States exploring expedition. Since completing his classical reports on the crustacea and zoophytes obtained by this expedition, about 1858, Professor Dana has devoted himself entirely to geological studies. During the summers of 1864, 1868, and 1870, Professors A. E. Verrill and S. I. Smith collected for the college at Eastport, Maine, both on the shore and by dredging. Several students of the college participated in these explorations, which resulted in rich accessions to the college museum. Zoological investigations have been carried on continuously in Long Island Sound, about New Haven. One of the most important of these was by Mr. Geo. H. Perkins, who collected and published on the shells of this vicinity. Since 1870, Professors Verrill and Smith and Mr. Oscar Harger have been connected with the exploring work of the United States Fish Commission, the first named being in immediate charge of the dredging operations. Important explorations were carried on for the college by Mr. F. H. Bradley, on the west coast of Central and South America, from 1866 to 1867, and by Mr. James Peterson in the vicinity of La Paz, Lower California, from 1868 to 1870. The collections made

by these two parties were enormous, and especially rich in mollusks, corals, Echinoderms, and Crustacea.

Wesleyan College, Connecticut.—Explorations of the marine fauna of Bermuda, by Mr. G. Brown Goode, in 1872 and 1877, the latter year in company with Professor W. N. Rice, and of the Saint John's River, Florida, for fresh-water fishes, by Mr. Goode, in 1874; collecting trip to the Grand Banks of Newfoundland, on behalf of the United States Fish Commission, by Mr. Henry Osborn, in 1878, and by Dr. F. V. Hamlin to Bermuda, in 1881.

Cornell University, New York.—Brazilian explorations of Professor Charles Fred. Hartt, partly under the auspices of the college, from 1867 to 1871. In 1874 Professor Hartt was appointed chief of the Geological Commission of Brazil, in recognition of his intimate knowledge of the natural features of that country, and retained that position up to the time of his death, in March, 1878. The plan of the survey included a thorough investigation of the marine and fresh-water fauna, and especially of the coral reef region, which presents many novel and interesting features. Extensive collections of marine and fresh-water animals of all kinds were made and taken to Rio de Janeiro, where they now form a part of the Brazilian National Museum. Preliminary reports have already been published regarding a portion of them. The zoological materials of Professor Hartt's private expeditions to Brazil are now at Cornell University. They have been fully described in published reports.

Union College, New York.—Studies and very extensive collections of marine annelids on the coasts of New England, New Jersey, and Virginia, by Professor H. E. Webster, from 1871 to date, assisted by Mr. J. E. Benedict, from 1878 to date. From 1871 to 1873, Professor Webster was a member of the exploring party of the United States Fish Commission.

Vassar College, New York.—Collecting trips of Professor James Orton to the Amazonas and west coast of South America.

Rochester University, New York.—Rare collection of foreign animals obtained by Professor H. Ward.

Princeton College, New Jersey.—Anatomical and embryological investigations of marine animals.

Johns Hopkins University, Maryland.—Anatomical and embryological researches of W. K. Brooks, E. B. Wilson, H. J. Rice, and others, at the mouth of Chesapeake Bay, and at Beaufort, North Carolina. Many valuable embryological studies of economic marine animals, for industrial purposes, have been conducted at this young institution, especially by Professor Brooks.

University of Indiana, and Butler University, Indiana.—Ichthyological explorations of the rivers and sea-coasts of the United States and Western Mexico, by Professor D. S. Jordan and Mr. C. H. Gilbert. In 1880 and 1881, Messrs. Jordan and Gilbert explored the west coast of the United States, from Puget Sound to, and including, the northwestern part of Mexico, in the interest of the United States Fish Commission, making enormous collections of fishes, including many new species and genera. The private explorations of these two gentlemen have been mainly confined to the fresh waters of Indiana, Kentucky, Tennessee, South Carolina, and Georgia, and the coast of the Gulf of Mexico. In 1878, Professor Jordan, with Mr. A. W. Brayton, made a large collection of marine fishes in the vicinity of Beaufort, North Carolina.

The collection of fishes of Jordan and Gilbert, at the Indiana University, is one of the largest and finest in the country, and contains an exceedingly large number of types. Professor O. P. Hay, of Butler University, has recently obtained and described many species of fishes from the Mississippi River.

NOTE.—The descriptive matter contained in the following catalogue has been partly made up directly from the objects, and partly taken from published and unpublished reports. The description of the steamer Albatross was furnished by Lieutenant-Commander Tanner, United States Navy, and many of those regarding the appliances used by the Coast Survey have been supplied by Commander Sigsbee, United States Navy.

DESCRIPTIVE CATALOGUE OF THE COLLECTION ILLUSTRATING RECENT SCIENTIFIC INVESTIGATIONS OF THE SEA AND FRESH WATERS.

VESSELS EMPLOYED IN MARINE EXPLORATIONS.

Steamer Albatross, of 400 tons net measurement, built expressly for all classes of marine exploration, and intended especially for investigating the off-shore fishing grounds of the United States. Represented by a model, photographs, and plans.

United States Fish Commission.

The United States Fish Commission steamer Albatross is an iron twin-screw steamer, designed by Charles W. Copeland and built under contract with the United States Government, in 1882, by the Pusey and Jones Company, of Wilmington, Delaware.

The vessel was designed and constructed for the purpose of deep-sea exploration. The hull is so modeled as to go astern safely in a sea-way while sounding and dredging. The rudder and its attachments are of extra strength, and, in addition to the hand and steam steering gear in the pilot-house, there is a powerful screw gear attached directly to the rudder head, a heavy iron tiller on the poop-deck for relieving tackles, and the usual rudder chains. The type of machinery and the various appliances were selected with a view to the special work for which she is intended. She is rigged as a brigantine carrying sail to a foretop-gallant sail.

Her general dimensions are as follows, viz: Length over all, 234 feet; length at 12-foot water-line, 200 feet; breadth of beam, molded, 27 feet 6 inches; depth from top of floors to top of deck-beams, 16 feet 9 inches; displacement (on 12-foot draft), 1,000 tons; register tonnage (net), 400 tons.

There are six transverse iron bulkheads, and six water-tight compartments.

Of the structures which rise above the main rail, the poop-cabin extends 30 feet forward of the stern-post, is the whole width of the vessel, and 7 feet 3 inches in height from deck to deck. It contains two state-rooms, bath-room, pantry, &c.

The deck-house is 83 feet in length, 13 feet 6 inches wide, and 7 feet 3 inches high from deck to deck. It is built of iron from the funnel aft, and sheathed with wood inside and out, with iron storm-doors; but from the funnel forward, it is of wood. Beginning aft in the iron house, the following apartments have been set off, viz: 1st, entrance to ward-

room stairway; 2d, upper engine-room; 3d, galley; 4th, steam drum room. In the wooden part: 1st, four state-rooms for civilian scientific staff. 2d, upper laboratory, 14 feet in length, the width of the house, and lighted in daytime by two windows and a door on each side and a skylight overhead. This room contains a central work-table, three hinged side-tables, a sink with alcohol and water tanks attached, wall-cases for books and apparatus, and the medical dispensary. 3d, chart-room, the width of the house, 8 feet 6 inches in length, containing chart-table, lockers for charts, book-shelves, berth, sofa, &c., and communicating with the pilot-house by a door in the forward bulkhead. 4th, pilot-house, 8 feet in length, the whole width of the deck-house, with elliptical front and glass windows, hung with balance weights and protected by strong wooden storm-shutters. The pilot-house projects 3 feet above the top of the deck-house, with which it communicates by two windows.

The top-gallant forecastle is 44 feet in length and 6 feet 3 inches in height, from deck to deck. The anchors, which are stowed on this deck, are handled by a single fish-davit, common to both, and a steam capstan. On the port-side, near the after end, is the Sigsbee deep-sea sounding machine.

Under the top-gallant forecastle are water-closets for officers and crew, men's bath-room, lamp-room, paint-locker, steam windlass, &c. There are two scuttles under this deck, one giving access to the store-rooms, magazine, &c., forward of the collision bulkhead, the other, to the berth deck, for use in bad weather. The forehatch also gives access to the berth-deck, which extends 40 feet fore and aft, is 7 feet 10 inches in height between decks, and comfortably fitted for the accommodation of the crew. Opening from the after end of the berth-deck is the steerage, provided with four double-berth state-rooms and a mess-room.

Abaft the steerage, but separated from it by an iron bulkhead, is the "lower" laboratory immediately below the "upper" laboratory, through which only can it be entered. This room extends quite across the ship, is 20 feet long, 7 feet 10 inches in height between decks, and is lighted in daytime by six 8-inch side lights, two 12-inch deck lights, and the hatch at the head of the stairway. Ample storage cases and lockers are provided for alcohol, jars, and specimens; long work-tables are placed on each side; in one corner is a large lead-lined sink with running water; in another, a photographic dark-room; and, across the after end, the chemical laboratory.

Below this room is the store-room, a closed iron box capable of being isolated from the rest of the ship and filled with steam at short notice, in case of fire. Here are stowed alcohol, specimens, nets, &c., for which lockers have been provided.

The vessel is propelled by twin screws, 9 feet in diameter and 14 feet 10 inches mean pitch. They are driven by two compound engines with two cylinders each, the high-pressure cylinders 18 inches and the low-pressure 34 inches diameter of bore, and 30 inches stroke of piston.

The condenser is common to both engines and forms their framing. The upper ends of the cylinders are drawn inboard over the condenser, making the engines slightly inclined.

The condenser has an aggregate of 2,150 square feet of condensing surface. There are two horizontal air-pumps, an independent circulating pump, two main feed-pumps, and two auxiliary pumps, which can be used as feed-pumps for fire purposes, or for bilge-pumps.

There are two overhead return-flue boilers, 8½ feet in diameter, 21½ feet long, with 93 square feet of grate surface, a steam chimney 7 feet 4 inches in diameter outside and 14 feet high above the shell.

The ward-room, next aft of the engine department, has eight state-rooms with bath-room and pantry. The navigator's, paymaster's, and ward-room store-rooms are in the hold below these quarters. In the fore hold are the water-tanks, bread-room, sail-room, steerage and engineers' store-rooms, cold-room, and ice-house. Forward of the collision bulkhead are the boatswains' and dredging store-rooms, the magazine, &c.

The special engines of the ship are as follows, viz:

A Providence steam windlass and capstan, built by the American Ship Windlass Company, of Providence, Rhode Island.

A hoisting engine for dredging, on the spar-deck forward of the foremast; a reeling engine on the berth-deck below the former for reeling up the dredge-rope. Both were built by Copeland & Bacon of New York.

Higginson & Company's steam quartermaster, built by the Pusey and Jones Company, is placed in the pilot-house and can be used either as a hand or steam steering gear.

Wise's steam motor attached to a Sturtevant exhaust-fan for ventilating the ship.

Ash hoister, designed by Passed Assistant Engineer G. W. Baird, United States Navy.

Svedberg's marine governors attached to the main engines.

Edison's dynamo and engine for electric lighting.

Heat is provided by steam radiators in all inhabited parts of the ship.

Ventilation is secured by means of conduits leading to all parts of the ship, through which air is drawn by the exhaust fan above mentioned, which is placed on a platform in the fire-room and arranged to discharge downward in the direction of the furnaces.

Light is provided by 120 8-candle B lamps of the Edison incandescent system, and a Z dynamo driven by an Armington and Sims high-speed engine. These lamps are distributed to all parts of the ship, including holds and store-rooms, and there are twelve lamps outside for lighting the deck.

In the laboratories the lamps are especially numerous and quite sufficient for any probable needs. An arc lamp of great power, designed by Dr. O. A. Moses, to work in circuit with the Edison incandescent

system, is used for illuminating the surrounding surface of the sea. A powerful submarine lamp is also provided, which can be lowered to any depth not exceeding 1,000 feet, to be used in deep-sea exploration.

Among the various appliances the following may be briefly mentioned, viz: the Sigsbee deep-sea sounding machine, sounding rods, water cups, and gravitating trap for collecting specimens at known intermediate depths, built by D. Ballauf, Washington, D. C.; Tanner's sounding machine for depths under 1,000 fathoms and for navigational purposes; the dredging boom, 36 feet in length and 10 inches in diameter, the heel pivoted to the forward part of the foremast, 7 feet 2 inches above the deck; the dredging block at the boom end, the sheave and register at the heel of the boom for indicating the length of dredge rope out, and the accumulator at the foremast head, arranged to prevent jerking strains on the rope (the accumulator used is of the form recommended by Commander Sigsbee, United States Navy); the Negretti and Zambra deep-sea thermometers, with the Bailie and Tanner improved cases; the Chester rake dredge; the well known beam trawl; the deep-sea trawl; the Chester towing net; the tangles, table sieve, seines, trawl lines, &c.,

INDEX TO THE DETAILED PLANS OF THE STEAMER ALBATROSS.

POOP-HOUSE AND FORECASTLE DECKS.

1. Forecastle.
2. Wooden bitts.
3. Fish-davit.
4. Capstan (connected with steam-winch).
5. 3-inch rifled howitzer.
6. Sigsbee deep-sea sounding machine.
7. Top of pilot-house.
8. Top of deck-house.
9. Bridge.
10. Sky-light over chart-room and laboratory.
11. Whale-boat.
12. Seine-boat.
13. Standard compass.
14. Smoke-stack.
15. Ventilator to fire-room.
16. Sky-light over drum-room and galley
17. Steam gig. (Herreshoff.)
18. Steam launch. (Herreshoff.)
19. Engine-room sky-light.
20. Dingey.
21. After-compass.
22. Mainmast.
23. Main-boom.

24. Bridge from poop to top of deck-house.
25. Poop-deck.
26. Cabin sky-light.
27. Iron bitts.
28. Screw steering-gear.

MAIN DECK.

29. Paint locker.
30. Chain cables.
31. Stopper for chain cable.
32. Compressor for steel-wire hawser.
33. Steam-winch.
34. Forecastle pump.
35. Lamp-room.
36. Bath-room for steerage officers.
37. Round-house.
38. Iron bitt.
39. Fore-hatch.
40. Hoisting-engine.
41. Dredging-boom.
42. Dredge-rope rove for use.
43. Tanner sounding-machine.
44. Foremast.
45. Ship's bell.
46. Pilot-house.
47. Steam or hand steering-gear.
48. Binnacle.
49. Signal-locker.
50. Deck-lights.
51. Chart-room.
52. Steam heater.
53. Chart table.
54. Wash-stand.
55. Chronometer chest and lounge.
56. Bunk.
57. Bunker plate and coal chute.
58. Upper laboratory.
59. Hatch to lower laboratory.
60. Work table for naturalists.
61. Dispensary case.
62. Book case.
63. Sink.
64. Steam heater.
65. Naturalists' state-rooms.
66. Bunk.
67. Wash-stand.

68. Bureau.
69. Steam drum.
70. Ash chute.
71. Ventilators for fire rooms.
72. Iron grating.
73. Galley.
74. Dresser.
75. Baird distiller.
76. Upper engine room.
77. Iron bitts.
78. Ward-room companion way.
79. Ward-room skylight.
80. Commanding officer's cabin.
81. Cabin pantry.
82. Captain's office.
83. State-room.
84. Bunk.
85. Bureau.
86. Wash-stand.
87. Lounge.
88. Sideboard.
89. Table.
90. Steam heater.
91. Bath-room.
92. Rudder-head.
93. Water-tank.
94. Silver closet.
95. Linen closet.

BERTH DECK.

96. Yeoman's store-room.
97. Fore passage.
98. Dredging store-room.
99. Brig.
100. Chain pipes leading to chain lockers.
101. Water-tight iron bulkhead.
102. Hatch to ice box.
103. Air port.
104. Bag rack.
105. Hatch to fore-hold.
106. Steam heater.
107. Reeling engine.
108. Spring accumulator and automatic stop-valve.
109. Steerage.
110. Steerage-rooms.

111. Bunk.
112. Bureau.
113. Wash-stand.
114. Table.
115. Cupboard.
116. Water-tight iron bulkhead.
117. Lower laboratory.
118. Lockers for specimen bottles.
119. Steam-heater.
120. Sink.
121. Table.
122. Photographer's dark room.
123. Coal chutes.
124. Air ports.
125. Coal bunkers.
126. Boiler.
127. Fan-blower for ventilating the vessel.
128. Iron grating.
129. Main engines.
130. Dynamo machine (Edison).
131. Ward-room companion ladder.
132. Ward-room pantry.
133. State-room.
134. Bureau.
135. Wash-stand.
136. Bunk.
137. Ward-room.
138. Table.
139. Steam-heater.
140. Lounge.
141. Iron water-tight deck.
142. Bath-room.
143. Cabin store-room.
144. Quadrant-room.
145. Ventilating-pipe.
146. Quadrant of rudder.

HOLDS.

147. Magazine.
148. Magazine passage.
149. Fore-peak.
150. Ventilating-pipe with branches.
151. Keelson.
152. Keel.
153. Chain-locker.
154. Water-tight iron bulkhead.

155. Ice-box.
156. Cold room.
157. Upper hold
158. Lower hold.
159. Steel wire hawser reel
160. Store-rooms.
161. Fresh-water tanks.
162. Water-tight iron bulkhead.
163. Laboratory store-room.
164. Ballast-room and sinkers.
165. Water-tight iron bulkhead.
166. Coal bunker.
167. Boiler leg.
168. Fire-room.
169. Lower engine-room.
170. Water-tight iron bulkhead.
171. Ward-room store-room, and shaft alleys.
172. Water-tight iron bulkhead.
173. Paymaster's store-room.
174. Equipment store-room.
175. Propeller shaft.
176. A-frames for propeller shaft.
177. Propeller.
178. Rudder.
179. Rudder-chains.

Steamer Fish Hawk, 205 tons measurement; built for fish hatching and scientific investigations near the coast. Represented by models and photographs.

United States Fish Commission.

The United States Fish Commission steamer Fish Hawk is a twin screw propeller of 205.71 tons measurement, is rigged as a fore-and-aft schooner, with pole topmasts, and was constructed for the combined purposes of fish hatching and dredging. She was designed by Mr. Charles W. Copeland, consulting engineer of the United States Light-House Board, and was completed in the spring of 1880. The Pusey and Jones Company, of Wilmington, Delaware, were the builders. The work of fish hatching necessitates her entering, at times, the shallow waters of rivers, bays, and sounds along the coast, and she has, therefore, been given a light draft, which unsuits her for long trips at sea, distant from land. "The hull below the main deck is of iron, built on Lloyd's rules for vessels of her class, and sheathed with yellow pine, from $2\frac{1}{2}$ to 3 inches thick, calked and coppered. Above the main deck the structure is of wood. There is a hurricane deck extending from stem to stern, and side to side, on which are located the pilot house, captain's

quarters, and laboratory." The general dimensions of the vessel are as follows:

	Feet.	Inches.
Length from rabbet to rabbet, on the seven-foot water line	146	6
Length over all	156	6
Breadth of beam molded	27	
Depth of hold amidships	10	9
Shear forward	4	4
Shear aft	1	9
Mean draft	6	5½

Hold.—There are five iron bulkheads, all of which, with one exception, are water-tight. In the hold, abaft the collision bulkhead, are two ice-houses, about 10 feet square. Forward and aft of these are several store-rooms, including two for natural history purposes. Next aft is the steerage, having a length of 15 feet. Under the steerage and store-rooms is the forehold, 32½ feet long, and containing the water tanks, having a capacity of 800 gallons. The boilers, coal bunkers, fire-room, and engines are located between bulkheads Nos. 3 and 4, abaft of which is the lower cabin, 26 feet long, with seven open bunks on each side, and including the dispensary, a linen room, pantry, and store-room. Still further aft, in the stern of the ship, is a cabin store-room, entered through a scuttle in the main deck.

Main deck.—The forecastle extends 31 feet aft from the stem, and is succeeded by the main or hatching deck, which is 47 feet long. The latter has on each side a gangway port abreast of the foremast, 6 feet wide and extending from deck to deck, and four large swinging ports. The boiler hatch occupies the after part of this deck, and is raised about 9 inches above it. On the hatch are placed the donkey-pump and distributing tanks for the hatching apparatus, which is arranged around it. When engaged in dredging, the hatching apparatus, excepting the pump, is entirely removed from this deck, and it becomes the working quarters of the naturalists. The beam trawls and dredges, which are manipulated from the upper deck, are passed in at the gangway port on the starboard side, their contents emptied into sieves and washed, and then transferred to swinging tables, where they are sorted, examined, and studied. The arrangements for this class of work are very convenient, and the working space ample. With all the ports open on both sides, the deck receives an abundance of light. The donkey-pump is used for washing the materials emptied into the sieves.

Abaft the hatching deck come the donkey boiler room and galley, the engine-room and cabin pantry, and finally the cabin, followed by the small after deck in the stern, which is about 14 feet long. The cabin is abaft the engine-room, is 30 feet long, and has four rooms on a side, with one bunk in each.

Aft, on the starboard side, is the Fish Commissioner's office. The

lower cabin companion-way is amidships, and a bath-room and closet on the port side.

Hurricane deck.—Forward of the foremast are the hoisting and reeling engine, and the dredging boom, the heel of which is attached to the mast. Abaft the mast, in succession, come the booby-hatch, covering the entrance to the main deck, the pilot-house, and captain's quarters. Then follow the funnel, engine-room skylight, and deck laboratory, which latter measures about 10 by 12 feet, has seven windows and one door, and is fitted up for microscopic work and study. Aft of the laboratory the deck is occupied only by the mainmast, cabin sky-light, compass, and rudder-head.

Motive power.—As before stated, the Fish Hawk is furnished with two propelling screws, right and left handed, one under each counter, which enable her to turn around almost within her own length. The double screw arrangement also greatly facilitates the handling of the vessel when dredging. Each screw is driven by one inverted cylinder surface-condensing engine, 22-inch diameter of cylinder, and 27-inch stroke of piston.

Boats.—There are four small boats, one of which is a steam cutter, of the Herreshoff pattern, with a coaling capacity for twenty-eight hours' steaming, at 6 knots per hour.

Hoisting engine.—The hoisting engine used for dredging purposes is of the trunk pattern, and was manufactured by Messrs. Copeland and Bacon, of New York. It has two cylinders, $8\frac{1}{2}$ inches in diameter and 9 inches stroke of piston, with cranks at right angles. It is fitted with the common D slide valve worked by the Stephenson link. The main shaft is forward of, and parallel to, the crank shaft, the two being connected by means of gearing. Upon the main shaft is a loose drum, holding 1,000 fathoms of three-eighth inch steel wire rope, which can be thrown in and out of action by means of a friction clutch. On each end of this shaft there is a small fixed drum used for ordinary hoisting purposes. There is also a friction brake for holding the load on the main drum, and an automatic guide for coiling the wire neatly upon the drum. Steam may be used either from the main or auxiliary boiler, and exhausts into the escape pipe of main safety valve. The wire, after leaving the drum, passes over a pulley at the masthead, returning under another in the heel of the hoisting boom, through one at the outer end of the boom, and thence to the bridle of the trawl. There is attached to the pulley at the masthead an accumulator for relieving sudden strains upon the rope. One man attends the engine, hoisting and lowering the trawl or dredge without the necessity of touching the rope by hand.

Dredging boom.—"The dredging boom is 36 feet long and 10 inches in diameter; the heel is secured to the foremast by a strong gooseneck, 5 feet above the deck. The forward end, when not in use, rests in a cradle on an iron frame, in which the ship's bell is suspended. There

is an iron band at the boom end for fore-and-aft guys. The topping-lift band is about 3 feet from the end, and has a strong link on the under side, to which is hooked the dredging block. The topping lift is composed of two 14-inch double blocks and a 4-inch manila rope. The upper block is shackled to an iron collar on the foremast, 3 feet below the eyes of the rigging. There is a strong sheave in the boom, inside of the lower topping-lift block, over which is rove the pendant of a a tackle, used for hoisting the bag of the trawl on board, when the weight is too great to be managed by hand. A composition sheave is inserted in the heel of the boom, two revolutions of which are equal to one fathom of dredge rope, and attached to its shaft is a register which accurately records the amount of rope out at all times." The accumulator, dredging blocks, safety hooks, wire rope, &c., belonging to the dredging gear of the Fish Hawk, are described further on.

Preparations for dredging.—"The rope being on the reel, the end is passed between the rollers of the automatic guide, carried aloft and rove through the block on the lower end of the accumulator, brought down again and rove under the registering sheave in the heel of the boom, thence through the dredging block at the boom end, and spliced into the eye of the safety hooks. The boom is then topped up, and secured over the side port by strong fore-and-aft guys, the trawl shackled to the safety hooks and swayed up clear of the rail, a man at each end to steady it, an engineer at the hoisting engine, and an officer in charge, ready at the order to lower away."

Sounding machines.—The principal sounding machine (Tanner's pattern) is supported in the rail on the port side of the forward hurricane deck, and a smaller machine of the same pattern is mounted at the stern.

The steamer Fish Hawk has been used for dredging purposes during the summer months of the past three years, and has accomplished very important results, notwithstanding the fact that it has been deemed best not to trust her more than twelve hours' sailing from land. Her principal field of exploration has been the inner edge of the Gulf Stream slope, off the southern coast of New England, down to depths of over 700 fathoms. She has been supplied with all the most improved kinds of dredging and trawling apparatus, and has made continuous series of careful temperature and density observations over the entire area of her operations.

LIST OF PHOTOGRAPHIC VIEWS, ILLUSTRATING THE DREDGING AND SOUNDING APPLIANCES OF THE STEAMER FISH HAWK.

PLATE 1. The forward part of the steamer, side view, with the dredging boom in position for use and the beam trawl ready for lowering.

PLATE 2. Forward deck, looking forward from the port side of the pilot house, showing the hoisting engine, and the dredging boom resting in the cradle.

PLATE 3. The hoisting engine on the forward deck, seen from in front, with the reel partly filled with wire dredge-rope. The register for recording the amount of rope out is seen at the base of the dredging boom, which is lowered. The pilot house occupies the background.

PLATE 4. Starboard side of the forward main deck, looking aft, as arranged for the use of the naturalists while dredging. The table sieve stands in the foreground, and the swinging work table, with bottles and dishes, is seen beyond it.

PLATE 5. The after part of the hurricane deck, with the dredging apparatus distributed over it, and the sounding machine in position at the stern.

PLATE 6. The table and cradle sieves dismantled on the after deck.

PLATE 7. The Tanner sounding machine complete, with metal and wooden cases for the Negretti and Zambra deep-sea thermometer attached; side view. Underneath the machine are a coil each of sounding wire, hand line, and deep-sea lead line, to show comparative sizes.

PLATE 8. The same, front view, in position for heaving in.

PLATE 9. The same, front view, in position for sounding, with the Bassnet atmospheric lead.

PLATE 10. The accumulator, Sigsbee's pattern; dredging block, and safety hooks.

PLATE 11. The safety hooks.

PLATE 12. The Negretti and Zambra thermometer; wooden case for same supplied by the makers; original metal case for same, with accessories, designed by Lieut. Z. L. Tanner, United States Navy.

PLATE 13. Hilgard's ocean salinometer.

PLATE 14. The wardroom of the Fish Hawk.

Steamer Blake, 350 tons measurement, built expressly for sounding and dredging purposes. Represented by photographic plates and plans.

United States Coast and Geodetic Survey.

"The United States Coast Survey steamer Blake was built for the special work on which she is employed. She is a screw steamer, of 350 tons O. M., 150 feet long on the load line, 26½ feet breadth of beam, and has a deep draught of 11 feet. Her engine is compound, of about 70 nominal and 270 actual horse-power, and her bunkers will hold sufficient coal for thirty-eight days' steaming. The rig is that of a fore-and-aft schooner. Aft on the main deck are spacious and well-ventilated quarters for the officers. Forward of the wardroom, on the same deck, is a continuous line of midship houses, reaching nearly to the foremast, and forming the engine-room, boiler-room, galley, pantry, draughting room, lamp-room, and mechanics' sleeping room. The arrangement of the main-deck houses leaves, on either side, a wide gangway, ventilated and lighted along its whole length through large square ports, which can

be kept open at sea in any ordinary weather. Beneath a sufficiently large berth-deck, is a good-sized hold, with tanks for holding 2,500 gallons of fresh water; while under the cabin and wardroom, and accessible only from those apartments, are large store-rooms. The upper deck is flush, and gives ample room for the reception of all the necessary machinery and gear."

Sounding appliances.—The principal work of the Blake has been the taking of deep-sea soundings, for which purpose the Sigsbee sounding machine, elsewhere described, is now used for all depths below 100 fathoms. It was while in command of the Blake, from 1874 to 1878, that Lieutenant-Commander Sigsbee perfected his sounding apparatus on the Thomson principle. The position assigned to this sounding machine on the Blake, in its original form, was the port bow, as far forward as it could be set. For sounding, the vessel was laid head to the wind, with mainsail set, and the main boom amidships. The latest form of the machine, however, which permits of reeling in while steaming ahead, is placed just forward of the port fore-rigging. Here, nearly all the advantage of the former position is retained, and there is a straight lead aft for hauling in the wire as it trails astern, while the vessel has headway.

Dredging boom, &c.—The dredging boom is 47 feet long, and 14 inches in its greatest diameter, the metal fittings and fastenings being of wrought iron. The topping lift is of 3-inch manila, rove through iron-strapped blocks, made extra strong, and the pendant is of $4\frac{1}{2}$-inch manila. The small block at the boom end is of a well-known commercial pattern, extra fastened. The pendants of the guys are of 2-inch wire rope, and the falls for the same of $2\frac{1}{2}$-inch manila. Other special features of the dredging outfit of the Blake, all of which originated on that vessel, are wire dredge-rope, the accumulator of rubber buffers, the iron dredging blocks, double beam trawl, and deep-sea dredge. These are described in detail further on, and are shown in connection with the vessel in Sigsbee's series of plates of the Blake, exhibited.

Dredge reel, hoisting engine, &c.—The dredge reel of the Blake (plate 32) is capable of holding over 4,200 fathoms of wire dredge rope. The drum or barrel is of boiler iron, 3 feet 6 inches long by 2 feet in diameter, and is riveted to fillets on the two cast-iron side plates. The depth of the flanges above the drum is one foot. The side plates are made with spokes. The friction band is of wrought iron, lined with maple 1 inch thick. The standards are of cast iron, and the axle of wrought iron, $2\frac{7}{8}$ inches in diameter, reduced to $2\frac{5}{8}$ inches in the journal boxes. The friction lever is of the double-acting kind—that is, both ends of the friction strap or band are bolted to the lever, one on each side of the pivot.

The hoisting engine (plate 33) has two trunk-cylinders of the pattern known as Bacon's patent, each of $10\frac{1}{2}$-inch bore and 10 inches stroke, firmly secured to the bed-plate at an angle of 45°, thereby avoiding a

dead center, both being connected to the same crank-pin. The engine is provided with "link-motion," so that it may be run forward or backward, or stopped instantaneously, by the operation of the reversing-lever, which is fitted to lock in three positions. By its elastic flexure the lever, in locking, is thrown into jogs cut in the flange of the standard, against which it presses. The after lever, working in a vertical plane, as shown in the plate, is the reversing-lever.

The winch-head, which is 22.56 inches in its least diameter, to accommodate one fathom of the $1\frac{1}{8}$-inch dredge-rope in a single turn, is keyed to its shaft, the latter working within the larger gear-wheel. It is provided with a powerful friction-brake, operated by a lever, and may be thrown in or out of gear with the engine by means of a lever, and overhauled independently. Below the brake-lever is the throttle, the wheel of which is made large that it may be turned easily and delicately with the left hand, when the right hand is engaged with the brake-lever. On the hub of the winch-head is a steel worm, to engage the gears of a register (plate 38), which indicates approximately the number of fathoms of dredge-rope payed out. On the after end of the crank-shaft, outside of the fly-wheel, is a small winch-head for general use. The pressure of steam is usually 60 pounds.

The winding-engine is of the same general description as the hoisting-engine, has two 6-inch cylinders, and is single-geared to the axle of the dredge-reel. It is fitted with reversing and clutch levers, arranged for locking in position. The engine and reel are under the control of one man.

Commander Sigsbee makes the following interesting general remarks regarding the dredge-reel: "For dredging in depths no greater than 500 fathoms, which would require no more than 1,000 fathoms of rope on the working reel, the latter might be made part of the hoisting-engine, and be geared to the crank-shaft. The advantage would be in compactness and simplicity. For general work, the plan adopted by the Blake is probably better. When the reel takes the full strain on the rope in hauling back, great strength is needed to resist the crushing force accumulated upon the drum, and to adapt a reel capable of holding 4,000 or 5,000 fathoms of rope to this strain would involve an increase in its weight by no means desirable, either for paying out rope or for planting on a vessel's deck."

The hoisting-engine and reel of the steamer Fish Hawk, which limits her dredging operations to moderate depths of water, are, as described elsewhere, combined in the manner recommended by Commander Sigsbee.

The positions allotted to the several dredging and sounding appliances on the Blake, are shown diagrammatically on plate 29, and graphically on numerous other plates.

LIST OF PLATES ILLUSTRATING THE DEEP-SEA SOUNDING AND DREDGING APPLIANCES OF THE STEAMER BLAKE DURING HER EXPLORATIONS OFF THE SOUTHERN AND EASTERN COAST OF THE UNITED STATES, FROM 1874 TO 1879.*

PLATE 1. The United States Coast Survey steamer G. S. Blake, 350 tons, fitted for deep-sea sounding and dredging.

PLATE 2. Fig. 1, Miller-Casella thermometer case, fitted with Sigbee's spring clamp. Above is shown a piece of the sounding-wire. Fig. 2, sounding-rod; a slight modification of Captain Belknap's sounding-cylinder No. 2, with Sigsbee's detacher. The construction is shown on plate 39.

PLATE 3. Fig. 1, Miller-Casella thermometer case fitted with Sigsbee's spring clamp. Fig. 2, sounding-rod; a slight modification of Captain Belknap's sounding-cylinder No. 2, with Sigsbee's detacher.

PLATE 4. Showing some of the causes, probable and real, of the occasional failures of sinkers to detach.

PLATE 5. Fig. 1, cans for observing currents. Fig. 2, sounding-lead, fitted with Stellwagen specimen cup.

PLATE 6. Showing the general form and working of Sir William Thomson's sounding-machine as used on board the Blake during her first season in the Gulf of Mexico; rigged for paying out.

PLATE 7. Experimental form of the Sigsbee machine for sounding with wire; used for three years on board the Blake; rigged for paying out.

PLATE 8. The latest form of the Sigsbee sounding-machine as now used on board the Blake; rigged for paying out. The construction is shown in plates 36, 37, and 38.

PLATE 9. The Sigsbee sounding-machine, rigged for paying out. (Second view.)

PLATE 10. The Sigsbee sounding-machine, rigged for paying out. (Third view.)

PLATE 11. The Sigsbee sounding-machine, rigged for reeling in, with the strain pulley brought into use.

PLATE 12. The Sigsbee sounding-machine folded for transportation.

PLATE 13. The Sigsbee sounding-machine in position on the Blake; run out for work; front view.

PLATE 14. The Sigsbee sounding-machine in position; run in, with the tubes lowered and the accommodation grating triced up.

PLATE 15. The Sigsbee sounding-machine in position, run out for work; side view.

PLATE 16. New steel reel for sounding with wire, devised by Lieut. Commander C. D. Sigsbee.

---

*Extracted from "Deep-Sea Sounding and Dredging, a Description and Discussion of the Methods and Appliances used on board the Coast and Geodetic Survey Steamer Blake, by Charles D. Sigsbee, Lieutenant-Commander U. S. Navy; Assistant in the Coast and Geodetic Survey," Washington, 1880.

PLATE 17. Another view of the same.

PLATE 18. Plan of patent trunk reeling-engine for the Sigsbee sounding-machine to occupy the place on the bed board at present assigned to the strain-pulley, should the latter not be required. Designed by Mr. Earle C. Bacon.

PLATE 19. Water-specimen cup for getting a single specimen at each haul; independent poppet-valves. Used in the Coast Survey for a number of years.

PLATE 20. The Sigsbee water-specimen cup for getting specimens from various depths at a single haul, by using a separate cup for each depth from which a specimen is required. The construction is shown on plate 40.

PLATE 21. Fig. 1, case for the Negretti and Zambra deep-sea thermometer. Fig. 2, the Negretti and Zambra deep-sea thermometer without its case. Fig. 3, The Miller-Casella deep-sea thermometer, apart from its case.

PLATE 22. Same as above.

PLATE 23. The Negretti and Zambra deep sea thermometers in use.

PLATE 24. The Blake, at the Washington navy-yard. The dredging-gear ready for work.

PLATE 25. Fig. 1, style of dredge supplied for the first dredging expedition of the Blake. Figs. 2, 3, 4, dredge devised by Lieut. Commander C. D. Sigsbee, United States Navy, and Master H. M. Jacoby, United States Navy, and adopted for use.

PLATE 26. Fig. 1, plan of trawl as first used on board the Blake. Fig. 2, plan of trawl as improved by Prof. A. Agassiz, Lieut. Commander Sigsbee, and Lieutenant Ackley.

PLATE 27. The improved trawl ready for use.

PLATE 28. The improved trawl shown as having "tripped," after fouling with rough bottom.

PLATE 29. Plans of the deck and apparatus of the Blake.

PLATE 30. View of the Blake's deck, looking forward from the bow of the starboard-quarter boat, ready for paying out the dredge.

PLATE 31. View of the Blake's deck, looking aft from the starboard side of the pilot-house, ready for dredging.

PLATE 32. The forward side of the dredge-reel and its engine; the reel has 2,700 fathoms of the wire dredge-rope.

PLATE 33. View of the main hoisting engine from the starboard side.

PLATE 34. Figs. 1 and 2, iron snatch-block for dredge-rope. Fig. 3, improved accumulator for dredging.

PLATE 35. The plotting of a line of soundings.

PLATE 36. Detailed plans of an improved machine for sounding with wire, on the principle of Sir William Thomson, by Lieut. Commander C. D. Sigsbee, United States Navy.

PLATE 37. Continuation of plate 36.

PLATE 38. Continuation of plates 36 and 37.

PLATE 39. Detailed plans of Sigbee's detacher used in connection with a modification of Captain Belknap's sounding cylinder No. 2.

PLATE 40. Detailed plans of Sigsbee's water specimen cup.

PLATE 41. Sounding with wire; curve for correcting the reading of the register placed on the axle of the sounding reel, by Lieutenant-Commander Sigsbee, United States Navy; Commander Howell's method of splicing the wire; Lieut. Commander Sigsbee's method of splicing the wire into the "stray line."

PLATE 42. Sigsbee machine for sounding with wire; pattern of 1881. Fig. 1, rigged for reeling in by steam. Fig. 2, in temporary disuse.

PLATE 43. Sigsbee machine for sounding with wire; pattern of 1881. Fig. 1, rigged for paying out; clamps in use. Fig. 2, folded for transportation or stowage.

APPARATUS FOR COLLECTING ZOOLOGICAL MATERIALS.

Naturalists' Deep-Sea Dredge, for use from a large vessel or steamer.

United States Fish Commission.

The naturalists' dredge ordinarily employed on the American coast for all kinds of bottom, excepting those of soft mud and ooze, is of the old pattern, long since adopted both in Europe and the United States. For use from large vessels it is constructed of the following dimensions: The frame measures 2 feet long, and about 5½ inches broad inside, at the hinder end. The upper and lower sides, or scrapers, are 2¾ inches wide, and one-half inch thick posteriorly, but thin out to a sharp edge in front, and flare considerably, so that the width of the mouth between the scraping edges is about 7½ inches. The end pieces are of three-quarter-inch round iron, welded to the scrapers. The handles are 18 inches long, of three-quarter-inch round iron. Two different styles of nets are employed with this size of dredge frame, both woven of twine, one being closed at the hinder end, and the other open to permit of the contents being emptied without reversing the net. The latter form, which has given the greatest satisfaction, is made about 3 feet long, of webbing, having three or four meshes to the linear inch, and is securely tied at the hinder end before lowering. Either kind of net is covered with a bottomless bag of heavy canvas, about 3½ feet long, and attached directly to the frame. It is intended to protect the net against wear.

Naturalists' Boat-Dredge, for use from a small sail-boat, row-boat, or steam-launch.

United States Fish Commission.

The so-called boat-dredge differs from the deep-sea dredge merely in size. It is intended for use from a sail-boat or steam-launch. The frame is 18 inches long, 5½ inches wide inside, and 7½ inches wide between the scraping edges. The scrapers are one-half inch thick and 2½ inches wide; the handles are 16 inches long, and the net is 2½ feet long, with

six or seven meshes to the linear inch; it is closed at the lower end, and has a canvas covering like the large dredge. The lower part of the net has a somewhat closer mesh than the sides.

Blake Dredge, for use on bottoms of soft mud or ooze, in deep water.

United States Fish Commission.

The Blake dredge was devised during the winter of 1877–'78 by Commander C. D. Sigsbee, United States Navy, and Master H. M. Jacoby, United States Navy, then attached to the United States Coast Survey steamer Blake, for use on the soft bottoms of mud and ooze which characterize the deeper waters off the coast. These officers were led to make this improvement over the old style of dredge, for the purpose stated, from the fact that the latter implement tends to fill and become clogged as soon as it falls upon a bottom of very soft materials, thereby preventing its proper working. The essential features of the Blake dredge are its broad, non-flaring scrapers, and square frame, which cause it to rest flat upon the bottom, and prevent its digging in beyond a suitable depth. It skims over the ground, and, as only a little mud enters at a time, it is being constantly washed from the net, to a greater or less extent, by the great volume of water passing through at the same time, leaving only the coarser portions and the specimens behind.

This dredge has been in constant use by the Coast Survey since its introduction, and has given entire satisfaction. As used by the Fish Commission it has been altered somewhat in size and proportions, but otherwise retains its original form. The dredge exhibited, which is furnished by the Fish Commission, has the frame 3½ feet long, 4 feet broad, and 8½ inches high, of one-half-inch round iron. The scrapers are 6 inches wide, three-fourths of an inch thick, and thin out to a sharp edge in front; they are placed parallel to each other, and at the sides are fastened to the ends of the side pieces of the frame. The handles are 20 inches long and similar in character to those of the common dredge, though differing from them somewhat in shape. The net is constructed of webbing, having a half-inch square mesh, opens at the hinder end, and projects slightly beyond the frame, to which it is tied to prevent reversing while being lowered. The frame is covered on the four sides by heavy canvas to protect the net. On the steamer Blake several weights and hempen tangles were attached to the end of this dredge, but this practice has not been followed by the Fish Commission.

Chester Rake Dredge, for obtaining marine invertebrates which burrow deeply into the bottom.

United States Fish Commission.

The rake dredge was designed for the special purpose of obtaining those species of marine animals which burrow deeply into muddy and sandy bottoms beyond the reach of the ordinary form of dredge. In its present shape, it was first constructed in 1881, by Capt. H. C. Ches-

ter, of the United States Fish Commission. It consists of a rectangular iron frame, 3 feet long by 9½ inches wide, the iron measuring 2¼ inches in breadth and one-half inch in thickness. The two longer sides of the frame are each furnished on the outer side with six stout, rake-like, iron teeth, 7 inches long, which curve forward toward the tips, where they are sharply pointed. At their bases they are of the same size as the iron of the frame, and their front edges are sharpened. The handles are similar in shape to those of the common dredge, but measure over 3 feet in length; they fasten into eyes at the corners of the frame. Back of the rake frame there is attached one of the ordinary Blake dredges, which measures 4 feet in width, and, therefore, projects 6 inches on each side of it. This is intended to receive the loosened materials as they are plowed up by the teeth. The rake dredge is simple in its working, but requires considerable power to drag it along, especially through compact sand and mud. Many species of animals, previously unknown, have been recently obtained by its use. The first rake frame employed by the Fish Commission was planned by Prof. A. E. Verrill, in 1871, and continued in use up to 1881. It consisted of a triangular frame of flat bar-iron, with straight teeth projecting from both sides of one of the bars, the drag rope being attached to the opposite angle. The net which followed it was fastened into a light rectangular frame of round iron. Another style of rake dredge, invented by Captain Chester in 1881, has the teeth attached directly to the scraping edges of an enlarged dredge frame of the ordinary pattern.

Benedict Rake Dredge, for collecting small forms of invertebrates in moderate depths of water.

United States Fish Commission.

This dredge consists of a double rake, and a cylinder of galvanized sheet-iron, 30 inches long by 11 inches in diameter, containing an elongate tapering strainer, and supported in an iron frame-work, having six runners of five-eighth inch round iron, about 4 inches high. These runners extend the entire length of the cylinder, and project behind it a distance of about 5 inches. They are arranged at equal distances apart around the cylinder, so that on whichever side it falls it is supported by two of them. The strainer is made of No. 40 brass wire cloth, is elongate, truncate-conical in shape, and has the same diameter in front as the cylinder, to which it is attached at the mouth. It tapers to a width of about 6 inches at the hinder end, where it rests against a coarse wire netting, forming the bottom of the cylinder. The mouth of the cylinder is furnished with a funnel-shaped collar of sheet-iron, opening inward, and with a short conical strainer, of coarse wire netting, projecting from in front. A bail of round iron, with a loop for the attachment of the dredge-rope, is fastened to the front end of the cylinder frame. The rake, which drags in front of the cylinder, is constructed of an oak bar, with two series of teeth on each side and a handle in front.

The teeth of the front series are straight, sharp, and rigid and those of the hinder series long, curved, and springy. The dredge line is attached to the front handle of the rake by means of marline only, passes to a ring at the hinder end of the rake, and thence to the cylinder bail, being securely fastened to both of the latter places. The object of this method of attaching the rope is to allow the marline at the front of the rake to part in case the latter becomes caught on the bottom, and permit of its being hauled up hind end foremost.

This form of rake dredge was designed by Mr. James E. Benedict, of the United States Fish Commission, for collecting small forms of marine life, and especially worms, which live unattached upon the bottom, on stones, shells, &c., and which are crushed or lost sight of in the ordinary dredge. It can only be used on comparatively smooth bottoms and in slight depths. The rake is intended to give the bottom materials a through stirring up so as to dislodge the animals, which together with the sediment formed are raised above the bottom and come into contact with the nose piece of the cylinder, only those below a certain size being able to pass in. The tapering shape possessed by the strainer gives it a very extended free surface for the outflow of water. The collar at the mouth of the cylinder being furnished with a light cloth veil, acts as a trap to prevent any reverse flow of water.

Beam Trawl, ordinary pattern for Zoological Collecting.

United States Fish Commission.

The beam trawls used by the United States Fish Commission are of the English fisherman's pattern, more or less modified to adapt them to the purposes of scientific investigation. They are made of different sizes, from $7\frac{1}{2}$ to 17 feet in length of beam. The trawl exhibited is of the smallest size, and is intended for use in deep water, or in shallow water from a small vessel. The beam is a piece of iron gas-pipe, $7\frac{1}{2}$ feet long and $2\frac{1}{4}$ inches in diameter, and it screws into brass strap bands on the tops of the runners, which measure 4 feet in length and 28 inches in height. The latter are constructed of flat bar-iron, $2\frac{1}{4}$ inches broad by five-eighths of an inch thick, and have a large screw-eye in front for the attachment of the bridle. To prevent the fish escaping through the runners, the openings which they form are closed by netting having a half-inch square mesh. This is fastened to an iron rod, which passes around the inner side of the runners and through brass screw-rings at intervals of 9 or 10 inches. The net is about 18 feet long, tapers gradually from the mouth toward the hinder end, and has a single pocket which consists of a slightly tapering cylinder of netting, about 5 feet long, fastened to the net by the larger end about 4 feet from the mouth; the inner end of the pocket is about 3 feet in diameter. The lead line is of $2\frac{1}{4}$-inch rope, and carries 42 small leads or sinkers. It is made very slack, and when in use trends back in the middle a distance of about 6 feet behind the hinder ends of the runners, to which it is

attached. The net has two different sizes of mesh, each making up one-half of the net in length. In the front half the meshes are 1 inch square and in the lower half one-half inch square.

Larger trawls of the same construction as the above, with the beam from 11 to 17 feet long and the net from 20 to 40 feet long, are most commonly employed by the United States Fish Commission, even in considerable depths of water. The otter trawl has also been frequently tried with good success in shallow water. Wherever the common beam trawl can be used advantageously, it is much preferred to the double trawl next described. No difficulty has ever been experienced in lowering it right side up to depths of 600 and 700 fathoms, and when used on the same spot in connection with the double trawl has always yielded the better results. On very soft bottoms it tends to sink too deeply into the ground, and for this a remedy has been suggested, namely, to fasten broad and thin wooden shoes to the bottoms of the runners, but this feature has not yet been put to trial. The towing-net attachments to this trawl are described elsewhere.

Blake Trawl, or Double Beam Trawl, for use in deep water.

United States Fish Commission.

The difficulty of landing the ordinary beam trawl right side up on the bottom in considerable depths of water resulted, during the first dredging cruise of the steamer Blake, in the winter of 1877–'78, in the construction of a new form of trawl, which, like the dredge, can work equally well either side down. For this new and valuable invention we are indebted to Prof. Alexander Agassiz, Lieutenant-Commander Sigsbee, United States Navy, and Lieutenant Ackley, United States Navy. The construction and appearance of this trawl, in its original shape, are illustrated in the Sigsbee series of plates. Although the United States Fish Commission has hitherto confined its explorations mostly to moderate depths of water, where the ordinary beam trawl answers every purpose, it has frequently experimented with the double trawl, and has introduced slight modifications, mainly as regards the height of the runners, which has been increased, in order to afford a larger opening for the capture of fish. The trawl exhibited is an exact copy of the pattern recently adopted for the use of the steamer Albatross.

The runner frames form a very broad D-shaped figure, being equally curved above and below in front, and extending thence straight back to the upright hinder end, which they meet at right angles, and beyond which they project a short distance, being perforated for the attachment of the net. These frames are 4 feet long and $3\frac{1}{2}$ feet high, and are made of half-inch iron, 3 inches broad. The beams are two in number, and consist of pieces of gas-pipe, $10\frac{3}{4}$ feet long and $2\frac{1}{4}$ inches in diameter outside. They screw into brass collars at the middle of the runners, one on the inner side in front, one on the inner side at the back. The bridle, constructed of $3\frac{3}{4}$-inch rope, is attached to two screw eyes,

which project from the front side of the runners. The net is 18 feet long, and is made of two thicknesses of webbing, having a 1-inch square mesh throughout. It has the same diameter at both ends, and to prepare for use is gathered in at the lower end and tied. The folds of the net, which are thus formed in tying, serve to close the mesh at the lower end and cause a small amount of mud, sufficient for examination, to be retained. A rope, measuring $2\frac{1}{4}$ inches in circumference, runs around the mouth of the net, and is laced along the hinder ends of the runners and fastened to the four hinder corners of the same. In common with the net, this rope is left sufficiently slack between the runners on both sides, so that on whichever side is uppermost it curves down just to the level of the beams and does not obstruct the lower half of the opening; the lower line naturally curves backward upon the ground. These slack portions of the rope form the lead line, and are each furnished with 16 leads, weighing about one-third of a pound each. The pocket for the net is made of the same webbing as the latter, is about 6 feet deep, and is fastened to the net about 3 feet from the mouth; it is somewhat smaller in diameter at the inner than at the outer end. To assist in keeping the net open while in use, four hollow glass balls or cork floats are fastened into it by means of a rope to which they are attached, and which is about one-third longer than the width of the net, and is seized to it on each side about 5 feet from the mouth. When the trawl is dragging on the bottom, these floats give greater buoyancy to the upper side of the net, and raise it above the ground. The escape of fish through the runner frames and between the beams, after they have been frightened by the lead-line, is prevented by means of netting, having a one-half inch square mesh. This is stretched tightly from beam to beam, and is fastened in the opening through the runners to a three-eighths-inch iron rod, extending around the inner side of the frame and passing through brass rings at intervals of 6 to 12 inches.

In the original double trawl, as used on the steamer Blake (see Sigsbee's plates), the framework differed from that above described only in its lesser height, which was 30 inches, and in lacking the iron rod within the runners for the attachment of the side netting. On the second dredging cruise of the Blake, instead of having the bridle tied to rings in front of the runners, it passed backwards along the sides of the runners and net to the hinder end of the latter, and was secured to the runners at the front beam by lashings passed through cut splices in the rope; to the runners at the rear beam by lashings taken around the rope; and to the seizing at the end of the net by lashings taken through thimbles which were turned into eye-splices. This form of bridle was intended to bring up the trawl rear end foremost, in the event of severe fouling on the bottom, the tripping being brought about by the parting of the lashings. On the same cruise another modification was put to trial. It consisted in enlarging the mouth of the net, carrying

the roping (lead line) forward and making it fast to the runners at each end of the front beam. The roping was given a longer bight to trail on the ground, and the upper bight was prevented from falling and closing the mouth by netting stretched between the beams. When using the double trawl in deep water, it is customary to weight the runners and the hinder end of the net.

For rapid trawling in pursuit of fish and crustacea, Prof. Alexander Agassiz recommends a slight modification of the above trawl, in which the runners are 18 inches high in front and 24 inches high behind. The iron of which they are made is only 2 inches broad, but otherwise the dimensions of the entire trawl are about the same as already given.

Tangle-Frame and Swabs for collecting marine animals having a spiny or otherwise roughened exterior, or bushy growths, especially on rocky bottoms where they cannot be reached by the dredge.

United States Fish Commission.

The old style of tangles, which consisted of several hempen swabs attached to a cross-bar at the hinder end of the dredge, has never been used by the United States Fish Commission, although frequently employed by the United States Coast Survey. The tangles, as a separate instrument, were devised by Prof. A. E. Verrill for the Fish Commission, in 1871, and in the same form, somewhat modified, have been in use ever since. The original set of tangles was constructed of three flat iron bars forming a triangle, the dredge or drag-rope being fastened at one of the angles, and the opposite bar having attached to it several small iron chairs, each about 15 feet long and bearing bunches of unraveled hemp rope at intervals of about 3 feet. Since then the triangular frame-work has been dispensed with, and the cross-bar or chain-bar is supported on two immovable wheels, one at each end, as shown in the sample exhibited. "The wheels are not intended to revolve, but to serve merely as runners and supports for the iron bar, in order to keep it off the bottom and diminish the chances of its getting caught among the rocks, as well as to keep it from breaking and destroying the specimens before the tangles themselves can touch them. An oval or elliptical form for these runners would answer the same purpose, but the circular form was adopted as the simplest and, perhaps, the least liable to become caught among the rocks." Following are the dimensions of the tangles now used by the Fish Commission: The chain-bar measures about 4 feet in length, and is made of one-half inch iron, 2 inches broad. The wheels are 12 inches in diameter, 2 inches broad, and one-fourth of an inch thick. The cross-piece to the wheels is of the same size iron as the chain-bar. The chains are 15 feet long, of one-fourth-inch iron, and the tangle bunches are about 2 feet long each. It may be advisable to increase the size of the iron for use from large vessels.

Towing Nets for collecting free-swimming marine invertebrates at the surface, or at intermediate depths between the surface and the bottom.

United States Fish Commission.

The towing nets employed by the United States Fish Commission are essentially alike in size and construction, whether for use at the surface, bottom, or intermediate depths. The ring is of one-fourth-inch round brass, 12 inches in diameter, and is arranged for the attachment of three leaders at equal distances apart, at each of which places two little copper wires are soldered around the ring, with a narrow space between them, just wide enough to permit of tying the leaders. This method of fastening the leaders permits of the net being inverted and used either side out, an advantage of considerable importance when working in a dirty sea. Two kinds of cloth are preferred for the nets—silk bolting cloth and linen cheese cloth or scrim, the former, although much more expensive than the latter, serving best and being more durable. Other kinds of material sometimes employed are fine embroidery canvas, bobbinnet lace, and crinoline. The nets are made from 18 inches to 2 feet deep, of two pieces of cloth cut in the shape of an elongate semi-ellipse, and, therefore, taper gradually and terminate in a full rounded end. A small stout cord is welded around the mouth, and serves for its attachment to the ring, which is made by means of a continuous piece of sail twine winding around the ring and through the net inside of the welded cord. Larger nets, with the ring 15 to 18 inches in diameter, are occasionally employed, and also for surface work an elongate, rectangular brass frame, measuring 30 inches in length by 6 inches in width. In using the circular towing nets from the steamer for collecting at the surface or at slight depths, a long spar is run out amidships on the starboard side, thus permitting of the handling of four or five nets at a time. For intermediate depths the nets have been attached to the dredge-rope at the proper places as the rope was being paid out.

Trawl Wings used in connection with the beam-trawls, for collecting free-swimming marine invertebrates at the bottom of the sea.

United States Fish Commission.

Since 1880, it has been customary to use the towing nets at the bottom, in connection with the beam-trawls of either pattern. This practice has been productive of most excellent results, and the towing-net attachments to the trawls have come to be considered of nearly as great importance as the trawls themselves. The ordinary form of towing net is used, and, while it is impossible to tell with certainty from what depth of water its contents were derived, whether at the bottom or on the passage up, it is certain that they are far richer in quantity and quality than when the nets are simply lowered to an intermediate depth. The method of using the towing nets at the bottom, which was devised by Capt. H. C. Chester, in 1880, is as follows: A rectangular

iron frame of one-half-inch round iron, 3 feet long and 8 inches wide, is swung loosely, by means of handles about 12 inches long, from a piece of iron gas-pipe, which is of the proper diameter to fit into the ends of the pipe forming the beam of the trawl, into which it reaches a distance of 1 foot or more. A large screw on the end of the beam holds it firmly in place. The frame is furnished with a coarse net, measuring from 3 to 4 feet in length and having about 3 meshes to the linear inch. The ordinary towing net, as described above, is now fastened into the coarse net by tying the ring to it, far enough from the mouth, so that the lower end of the fine net reaches nearly to the end of the larger one. Two arrangements of this kind are always used, one at each end of the beam. They are called the trawl wings, and the entire apparatus thus made up is termed the butterfly trawl.

Sigsbee's Gravitating Trap for collecting animal forms from intermediate ocean depths.

Commander Charles D. Sigsbee, United States Navy.

The old practice of dragging for animal forms at intermediate depths by means of a tow-net, which during the several operations of lowering, dragging, and hauling back remained open, not being regarded as affording sufficient evidence of the habitat of such specimens as were obtained, this apparatus was invented by Commander Sigsbee, at the request of Prof. Alexander Agassiz, who afterwards used it with success. (See Bulletin of the Museum of Comparative Zoölogy at Harvard College, vol. vi, Nos. 8 and 9, September, 1880.) The following explanation is drawn chiefly from No. 9 of the Bulletin, which was written by Commander Sigsbee.

"Our plan is to trap the specimens by giving to a cylinder, covered with gauze at the upper end and having a flap valve at the lower end, a rapid vertical descent between any two depths, as may be desired; the valve during such descent to keep open, but to remain closed during the processes of lowering and hauling back with the rope. An idea of what it is intended to effect may be stated briefly thus: Specimens are to be obtained between the intermediate depths *a* and *b*, the former being the uppermost. With the apparatus in position, there is at *a* the cylinder suspended from a friction *clamp* in such a way that the weight of the cylinder and its frame keeps the valve closed; at *b* there is a friction *buffer*. Everything being ready, a small weight or messenger is sent down, which on striking the clamp disengages the latter and also the cylinder, when messenger, clamp, and cylinder descend by their own weight to *b*, with the valve open during the passage. When the cylinder-frame strikes the buffer at *b*, the valve is thereupon closed, and it is kept closed thereafter by the weight of the messenger, clamp, and cylinder. The friction buffer, which is 4 inches long, may be regulated on board to give as many feet of cushioning as desired."

The following is a detailed description: A copper cylinder, riveted

to a wrought-iron frame, has a flap or clapper valve opening inwards and fastened to the shorter arms of a set of levers. The upper end of the cylinder is covered with a removable wire sieve (60 wires to the inch), and inside the cylinder are a wire sieve (27 wires to the inch) and a wire funnel or trap (27 wires to the inch). The steel-wire rope on which the cylinder travels is placed in loops at the upper and lower extremities of the frame, and is retained therein by serew-bolts.

The friction *clamp* is composed of a solid frame, two binding chocks, a clamping screw, and an eccentric trigger or tumbler. The friction *buffer* is composed of a solid frame, two binding chocks, a clamping screw, and a compression spring with a regulating screw for regulating the binding force of the spring. The bearing faces of the binding chocks are corrugated, and the inward movement of each is limited by a stud which forms part of the frame. In clamping the buffer to the rope, the chock next the clamping screw is *always* screwed inwards until stopped by its stud; the steel rope is, therefore, always pressed between the two chocks by the elastic force of the spring, which may be regulated as desired. To regulate the buffer for any definite frictional resistance, clamp it to the rope and move the regulating screw well inwards; then suspend from the buffer a weight equal to the resistance decided upon. Move the regulating screw outwards until the buffer slides down the rope, under the influence of the suspended weight. Since the chock operated by the clamping screw is always screwed "home" in clamping to the rope, the buffer remains regulated for prolonged use, and it is probable that the regulating screw need not be touched again for a whole cruise, if the buffer be rinsed in lye-water each time after use.

A cast-iron messenger in two parts, connecting with each other by a dovetail, is an important part of the apparatus. Professor Agassiz added the funnel-shaped trap, after a preliminary trial with the apparatus.

Working the apparatus.—It is necessary to first regulate the buffer to cushion the stoppage of the falling weights, which are, cylinder and frame 38 pounds, clamp 4 pounds, messenger 8 pounds, total 50 pounds. The Blake adopted a resistance of about 80 pounds (this resistance being, of course, constant during the whole movement of the buffer), it having been found that a blow of that force resulted in no injury to the apparatus.

On the ascent the buffer must withstand not only the weight of the 50 pounds of metal, but also the resistance which the water offers to the passage through it of the several parts of the apparatus. Moreover, when the cylinder emerges from the water it is full of that liquid, and with this increased weight would overcome the stated resistance of the buffer and force the latter downwards until the lead was reached. To meet these conditions it was not thought advisable to increase the resistance of the buffer, which would involve a heavier blow against the apparatus, but a rope-yarn seizing or stop was placed on the rope, about 15 or 20 feet below the buffer, beyond which the latter could not pass.

Having secured the buffer to the rope about 5 or 6 fathoms above the lead (a very heavy lead to keep the steel rope straight) and paid out the length of rope required to span the stratum to be explored by the cylinder, the clamp and cylinder are attached, the latter being suspended from the former as follows: The rope having been placed between the two binding chocks of the clamp, the arm of the eccentric tumbler is thrown up, which moves one of the chocks inwards; then, by means of the clamping screw, the other chock is pressed against the rope, securing the clamp in position. The cylinder hangs 4 or 5 inches below the clamp and is supported by a loop of soft wire which rests on the lip of the tumbler; the ends of the wire, being rove through holes in the upper part of the frame of the cylinder, are fastened permanently to the outer arms of the lever to which the valve is screwed. It is seen that by this method of suspension the weight of the cylinder and its frame is used to keep the valve closed while paying out.* The cylinder should be filled with water poured down through the upper sieve, to maintain the valve on its seat while the cylinder is being immersed. Rope is then paid out slowly until the cylinder is at the desired depth, when the rope is stoppered and the messenger sent down.

The messenger strikes the arm of the eccentric tumbler, throwing it down and tripping the cylinder. The tumbler in falling relieves the pressure on the binding chocks, which are then free to recede from the rope. Messenger, clamp, and cylinder fall together, the valve being held open by the resistance of the water. A current is established through the cylinder, and specimens which enter are retained by the upper sieve. When the buffer is reached, the valve is closed by the pressure against the outer arms of the lever.

A very slight pressure on the clamping screw of the friction clamp, after the chocks are bearing against the rope, is enough to prevent the clamp from slipping, but by an increased pressure on the screw a greater force is required to trip the tumbler, and by this feature the arm of the tumbler is utilized to break the force of the blow which the body of the clamp receives from the falling messenger. A few rings of sheet-lead may be laid on top of the clamp and the buffer respectively.

Baird Seine for the use of naturalists in collecting along the margins of the sea, lakes, and rivers.

Boston Net and Twine Company.

. These seines are made of several sizes, from 9 to 16 feet in length and from $2\frac{1}{2}$ to 4 feet in height. The center consists of a large and deep pocket, about 3 feet long, with a one-eighth-inch square mesh; the sides

*It is suggested that, in lieu of the soft wire sling, the friction clamp be constructed to receive the end of a stiff wire rod, proceeding from the ends of the valve levers, and that it be done in such a way that, when the valve is closed and the rod connected with the clamp, the bottom of the latter will be in firm contact with the upper part of the cylinder frame. Such an arrangement would effectually guard against the opening of the valve with any rapidity of descent.

of the net have a one-fourth-inch square mesh. The lower edge is furnished with a lead line and the upper edge with a line of wooden floats. A pole is fastened at each end as a means of handling it. This style of seine has proved very convenient for exploring parties on account of its small size, and is in constant use in the exploring work of the United States Fish Commission. Only two persons are required to manage it. It was designed some years ago by Prof. S. F. Baird, United States Fish Commissioner, whose name it bears.

Dip Net for scraping the piles of wharves, bridges, &c.

United States Fish Commission.

This is similar in construction to an ordinary dip-net, but is made of thicker iron, and has the outer side straight and broad, with a sharp edge for scraping. It is attached to a long pole and furnished with a coarse linen net. The common styles of dip-nets are shown in the section of fishery appliances. For natural history purposes they are generally fitted with bags of fine netting or coarse cloth.

ACCESSORY APPLIANCES USED IN CONNECTION WITH DEEP-SEA DREDGING AND TRAWLING.

Steel Wire Dredge Rope, showing the methods of splicing two pieces together, of attaching the dredge, &c.

United States Coast and Geodetic Survey and United States Fish Commission.

The wire rope used by the United States Coast Survey and United States Fish Commission for dredging purposes is made at Trenton, N. J., by the John A. Roebling's Sons Company. It is one and one-eighth inches in circumference, and is composed of six strands, laid around a tarred hemp heart. Each of the six strands consists of seven galvanized steel wires, of No. 19 American gauge (No. 20 Birmingham gauge). The ultimate strength of the rope is 8,750 pounds. It weighs 1.14 pounds to the fathom, in air, and about 1 pound to the fathom in sea-water.

Wire rope for dredging purposes was recommended by Prof. Alexander Agassiz in 1877, and was first put to trial on board the United States Coast Survey steamer Blake, in the winter of 1877–'78, during her first dredging cruise, Commander Charles D. Sigsbee, United States Navy, being in command, and Professor Agassiz in charge of the dredging operations.

Commander Sigsbee describes his experience with the wire rope as follows: "The adoption of steel-wire rope, although presenting to our minds at the outset a few difficulties which we confidently expected to overcome after a short experience, simplified matters as compared with what had previously been thought proper in a dredging outfit. Before

that time dredge ropes had been made of hemp or manila, and usually for deep work a tapering rope of 3 inches, 2½ inches, and 2 inches in circumference had been employed. The size of the steel rope selected for our work was 1⅛ inches in circumference throughout its entire length.

"For the first dredging cruise it was supplied in 3,000-fathom lengths, each length wound upon a separate wooden reel. For the second cruise, the working reel already having 2,700 fathoms upon it, I had the rope supplied on wooden reels, each containing only 500 fathoms, in which shape it was easier to handle in the event of having to replace losses at sea. One wooden axle common to all these reels formed part of the outfit.

"The shortest nip that we gave the rope was over the pulleys of the leading blocks, the scores of which were 18 inches in diameter, and this did not break up the zinc enough to give trouble from rusting. We used no preservative on the rope, and had no need for it; but that recommended by the Roeblings is raw linseed-oil applied with the fleecy side of a piece of sheepskin, or to the oil may be added equal parts of Spanish brown or lamp black.

"At the works wire rope is reeled up under strong tension, and in reeling off for use it should be passed directly from one reel to the other under at least slight tension, and it never should be coiled down or faked by hand. When supplied in a coil, the coil should be rolled along like a wheel, and the rope paid off in that way to the working reel.

"The dredge, trawl, &c., should always be attached to the rope by a shackle. We at first used hooks which we moused with wire, but they always broke adrift, probably by bending. Long shackles should be selected, of a size to slip into the thimbles and into the eyes in the arms of the dredge. I would call particular attention to this matter, hoping to prevent a resort to makeshifts."

It is now customary with the Fish Commission to fasten the trawls to the dredge rope by means of the safety hooks described elsewhere.

Splicing.—"In joining two lengths of the rope, a 'long splice,' at least 20 feet in length, is made. To make an eye splice at the end of the dredge-rope, turn the end of the rope around an oblong or heart-shaped thimble, and unlay each wire from the thimble to that end. Lay these wires as an untwisted strand along the rope, and serve wires and rope together tightly with annealed-iron wire for a distance of 8 or 10 inches from the thimble. Cut off the free ends of the wires about three-quarters of an inch above the serving, and turn down each wire neatly along the serving."

The splices on exhibition are made in pieces of rope actually used by the United States Coast Survey steamer Blake, and hence the kind of rope employed by that steamer is also shown.

Sigsbee's improved Dredging Accumulator for relieving the strain on the dredge rope; devised by Commander Charles D. Sigsbee, U. S. N.

United States Fish Commission.

The construction of the accumulator used by the United States Coast Survey and Fish Commission in connection with the dredging gear is shown on Sigsbee's plate No. 34. "This apparatus consists of a number of rubber buffers A A, arranged for compression on a rod B, and separated from one another and the rod by guide-plates C C. The upper end of the accumulator being secured at D, and a strain applied to the lower end at E, the compression of the buffers will permit the cross-head F to travel along the rod B, and the rods G G to travel through the guide-plate H and the cross-head I. In this manner the accumulator elongates under strain, and when released from strain is restored to its former length by the elastic force of the buffers." In this form of accumulator, which was devised in 1878, by Commander Sigsbee, for use on the Coast Survey steamer Blake, the only new feature claimed by the inventor is the peculiar shape of the guide-plates C C, the hubs or fillets of which keep the buffers from coming in contact with the rod B when the buffers are compressed. The buffers are 4½ inches wide and 3 inches thick, and have a circular hole through the center 1¼ inches in diameter. They are made of what is known as compound No. 24, consisting of 10 pounds of fine Pará rubber, 1 pound of white lead, 1 pound of litharge, 1 pound of whiting, and 10 ounces of sulphur, the vulcanizing heat being about 260° Fah. A somewhat harder compound than this has, however, been recently employed. The long rods, nuts, cross-heads, and large guide-plate are of steel; the small guide-plates between the buffers are of brass, and all the other metal parts of wrought iron. The small guide-plates are one-eighth of an inch thick, and their hubs are made to fit loosely upon the rod and tightly within the buffers.

The accumulator recently constructed for the Fish Commission steamer Albatross is of exactly the same pattern and size as that employed on the Blake, but on the steamer Fish Hawk a slightly smaller one is in use, differing from the others, however, only in length and in the number of buffers, the size of the latter being the same. The example displayed is copied from that of the Fish Hawk.

In the Blake accumulator the central rod accommodates thirty-two buffers without compression, but seven more are pressed on, in order that the accumulator may not extend for a light strain, Commander Sigsbee explaining that "neither an accumulator nor a dynamometer is of use excepting for a severe strain." The maximum extension of this accumulator is about six feet. The Fish Hawk accumulator contains only twenty-six buffers.

In Sigsbee's series of plates, the accumulator is shown in position for use, suspended from the mast-head, in Plates 1 and 24; and lowered into view in Plates 13 and 14. In the photographic views of the Fish Hawk it is also shown in place.

Iron Dredge Block for the dredge-rope, as used on the steamer Blake. Represented by a diagram (Plate 34 of Sigsbee's series)

United States Coast and Geodetic Survey.

On the steamer Blake the dredge-rope leads through one large snatch block at the boom end, and through several similar ones placed upon the deck. In the former the side plates are free to revolve, but in the latter they are pinned to the strap, and connected by socket bolts, which are intended to prevent the dredge-rope from getting between the side plates and the strap. The pins or bolts are of steel, the sheave of cast-iron, the side plates of thin plate-iron, the flap or hook and strap of wrought iron. The pendant block has the sheave 1 inch wider than the deck blocks.

Iron Dredge Block, used on the steamer Fish Hawk.

United States Fish Commission.

Two pendant dredge blocks are used on the Fish Hawk, one suspended from the lower end of the accumulator, the other from the outer end of the dredging boom, as shown in the photographs of that steamer. These blocks are similiar to one another and to those of the Blake. The example displayed is an exact copy of the one attached to the accumulator. The side plates are $19\frac{1}{2}$ inches in diameter, five-sixteenths of an inch thick, and have an intervening space of about 2 inches for the sheave. The latter is 16 inches in diameter, about $1\frac{3}{4}$ inches thick, and grooved to a depth of about 2 inches, the bottom of the groove being rounded and just wide enough to accommodate with ease a single turn of the dredge rope. The straps are in two pieces, fastened together in the middle by the bolt or pin which passes through the sheave, and has a nut at each end. The straps are one-half inch thick, 2 inches wide above the middle, and $1\frac{1}{4}$ inches wide below. A strong swivel-hook at the upper end furnishes the means of suspending the block. The materials used are the same as described for the Blake. In addition to these blocks there is an iron sheave fastened in the heel of the boom.

Brass Dredge Block, used on the steamer Albatross.

United States Fish Commission.

The same number of dredging blocks are used on the Albatross as on the Fish Hawk, and they have the same positions, but their construction is somewhat different, and the sheave revolves on a series of friction rods, which do away with the necessity of oiling. There are no side plates. The sheave is of brass, $21\frac{1}{2}$ inches in diameter, and about one-half an inch thick, excepting toward the center and rim. At the rim it expands to a thickness of about $2\frac{1}{4}$ inches, and is grooved to a depth of 2 inches, as in the previously described block. The hole through the center of the sheave is $3\frac{3}{4}$ inches across and $2\frac{1}{2}$ inches through, the sheave being thickened around it to form a sort of hub. The strap

is of iron, 4 inches wide by three-eighths of an inch thick, and is bent in the middle to form a right angle. At the outer end there is a small immovable ring, and at the upper end a very strong ∩-shaped eye bolted on for suspending the block. The center pin or bolt is of steel and passes through the strap at the angle, having a nut at each end. The friction rods are six in number, $2\frac{1}{8}$ inches long by $1\frac{1}{4}$ inches in diameter, and are suspended in a circle between two flat rings, one at each end, by means of a pin passing loosely through each rod and fastened into the rings. The rods are therefore free to revolve, independently of one another, though they touch slightly. This friction-rod arrangement, which is entirely of brass, fits snugly into the center hole of the sheave, and in turn receives the steel pin which serves as the axis for the sheave.

Safety Hooks, for attaching the beam trawl to the wire dredge-rope and releasing it in case of undue strain from fouling on the bottom. Represented by photographs.

United States Fish Commission.

"The safety hooks are designed for the purpose of detaching the trawl when, from any cause, such as fouling a rock or wreck, the tension on the dredge-rope reaches the limit of safety. They consist of a stout steel spring inclosed in an iron cylinder and controlling the opening and closing of a pair of heavy iron hooks, which project from one end, and can be adjusted to detach at any point between 3,000 and 6,000 pounds, by the nut on the end of the central rod. As used on the steamer Fish Hawk, they were set at 4,000 pounds, the breaking strain of the dredge-rope being 8,700 pounds. The details of construction are shown in the photographs. The spring and hooks being placed in the cylinder and the cap screwed on, the instrument is ready for use. The end of the dredge-rope is spliced into the eye and the trawl shackled to the hooks, which are held in position by their shoulders pressing against the inner surface of the cylinder. The spring is compressed as the tension increases until the limit of safety being reached the shoulders are released and the hooks open freely, allowing the shackle pin to slip through, detaching the trawl and relieving the rope from strain."

APPLIANCES FOR THE EXAMINATION AND STORAGE OF ZOOLOGICAL MATERIALS.

Table or Deck Sieve, for washing the contents of the beam trawls.

United States Fish Commission.

"This piece of apparatus is the result of several successive improvements, and was given its present form in 1877. It has been the joint invention of Prof. A. E. Verrill, Capt. H. C. Chester, and Mr. James E. Smith, of the United States Fish Commission. In fundamental principle it is like the cradle sieve much enlarged and raised on legs, but the

form is entirely different. Its original use was to receive the contents of the trawl instead of emptying it on deck, as had been done previously, but its advantages were soon found to be so great that it has also been used for washing the contents of the dredge whenever the quantity of mud was considerable.

"The sieve foundation consists of a large rectangular wooden frame, with wide side-pieces made of inch boards, supported on stout legs, at a convenient height, the legs being made of unequal lengths to correspond with the curvature of the deck. The bottom of the frame consists of stout galvanized iron-wire netting with one-half inch to three-fourths inch meshes. Below this is a funnel-shaped stout canvas bag which terminates in a large canvas tube. This serves to convey the waste water to the scuppers. A light frame of wood is made to fit loosely inside of the main frame, and its under surface is covered with fine wire netting of one-twelfth inch meshes. This constitutes the real bottom of the sieve, the coarse netting below serving only as a support for it. It is fastened to a movable frame so that it can be taken out and its contents emptied upon the assorting table. This also allows the wire netting to be more easily renewed when it becomes worn. The upper or coarse sieve is made with wide, flaring, or hopper-shaped wooden sides, upon which at about the middle there are cleats that rest upon the edges of the main frame. The bottom of the hopper is formed of strong galvanized iron wire netting of three-fourths inch meshes."

The dimensions of the table sieves used by the Fish Commission are as follows: Main frame—height to upper edge, 30 inches; length, 66 inches; breadth, 38 inches; width of side pieces, 11 inches. Hopper frame—width of side pieces, 13 inches; length at bottom, 56 inches; length at top, 66 inches; breadth at bottom, 27 inches; breadth at top, 37 inches.

The model exhibited is constructed of one-third the full size as to general dimensions and the thickness of the wood, but the wire netting is the same as in the large sieves.

Cradle or Rocker Sieve, for washing the contents of the dredges.

United States Fish Commission.

"This sieve was devised, in 1872, by Prof. A. E. Verrill, for the use of the United States Fish Commission. It was so constructed as to afford the means of rapidly washing out the large quantities of mud often brought up by the dredge and rake-dredge, and at the same time to keep the mud and water off the deck as much as possible. It consists of two wooden cross-pieces, in shape rather more than half a circle, united by two narrow wooden side pieces set into the end pieces so as to leave a flush surface. The outside covering consists of two thicknesses of wire netting, the inner one with meshes of one-twelfth inch or less, the outer one of stout galvanized iron wire with one-half inch meshes. The outer netting is only to afford support and protection to

the inner one. The netting is nailed to the edges of the wooden end pieces and to the side pieces, and is further secured by a strip of hoop-iron nailed over the edges all around. A strip of wood nailed across the bottom from end to end affords additional strength and protection from injury. Two stout iron straps, fastened across each end piece by wood screws and terminating above the edge in a ring, furnish the means of suspending this sieve against the side of the vessel outside the rail. The mud is then placed in it, often filling it more than half full, and a gentle stream of water from the force-pump is turned upon it. In this way several bushels of mud may be washed out in a few minutes with little trouble. Another sieve with straight wooden sides about 6 or 7 inches high—just large enough to set partially into the frame of the cradle sieve and rest upon wooden cleats provided for that purpose—has been sometimes used in connection with the cradle sieve. Its bottom is made of strong galvanized wire netting with meshes of one-half inch. It serves to separate the coarser specimens and stones from the smaller and more delicate species." In the work of the United States Fish Commission, the table sieve has to a considerable extent superseded the cradle sieve, especially where the amount of material to be handled is very great. As a rule, however, the cradle sieve is still generally used for the contents of the dredge, while the contents of a well-filled beam trawl requires the larger table pattern.

Nest of Circular Hand Sieves for washing small quantities of dredged material in a tub or bucket of water.

United States Fish Commission.

In working over small quantities of material, especially in search of the smaller organisms, circular hand sieves, in nests, have been employed by the United States Fish Commission, of the same general pattern as those described by Sir Wyville Thomson, in Depths of the Sea. These have usually been constructed with wooden frames, in nests of three to five sieves. Quite recently the wooden frames have been changed for others of galvanized sheet-iron, with good results. The old style of wooden frames, after a little use, lose their regular shape and will not nest snugly, and the beading, which runs above the wire bottom, is constantly becoming loosened and catching and concealing many small objects. The metal sieves are made in nests of three or four, one of the former and smaller nests being exhibited. In this, the lower sieve measures 10 inches in diameter in the inside, the middle sieve $9\frac{3}{4}$ inches, and the upper one $9\frac{1}{2}$ inches, the difference between these diameters being equal to about the thickness of the iron. The lower sieve has a height of $3\frac{1}{4}$ inches, the middle sieve $2\frac{3}{4}$ inches, and the upper sieve $4\frac{3}{4}$ inches. In the lower sieve the netting is raised three-fourths of an inch above the bottom, but in the other two it is flush with it. The lower netting is of copper, with 38 meshes to the linear inch, and on account of its lightness is strengthened underneath by a cross

frame work of moderately heavy wire; the second netting is also of copper wire, with 8 meshes to the linear inch, and the upper is of galvanized iron-wire, with 2 meshes to the linear inch. The several sieves are smooth and without angular projections on their inner surfaces, and fit snugly together. They are prevented from nesting too deeply by means of a wire bent in around the outer sides of the two upper sieves, 1½ inches above the bottom. This affords interspaces of about an inch between the nettings of the several sieves. The rims of the sieves are strengthened with wire, and the handles, which stand upright, are of such lengths that when the sieves are nested they reach to the same height, and can be grasped together. The nests of three sieves may be worked in a large bucket of water, but those of four sieves are larger, and require at least a small tub for their use.

Small Sieves for freeing minute animals from fine sand in a dish of water without motion.

United States Fish Commission.

Several different kinds of small single sieves are used by the United States Fish Commission for special purposes. One style (exhibited) is made with a copper frame, from 5 to 10 or more inches in diameter, and with a moderately fine mesh copper wire bottom, the entire sieve being nickle plated, to prevent corrosion. This sieve is gently lowered into a shallow dish of water, so as to rest against the sides of the dish a short distance above the bottom, the bottom of the sieve having been previously covered with fine dredged material, such as mud or sand, known or supposed to contain diminutive forms of life, such as small worms, copepods, amphipods, &c., which, in most instances, work quickly down through the meshes of the wire netting into the water in the dish, thereby freeing themselves in much better condition for study than could result from any other method. This style of sieve was first introduced by Prof. H. E. Webster and Mr. James E. Benedict, of Union College.

Fish Pans. Galvanized iron pans, for the examination of fish and other large objects at sea; used on the steamers Albatross and Fish Hawk.

United States Fish Commission.

These pans are made in nests, of heavy (No. 22) galvanized sheet-iron, with the edges strengthened by means of a wire bent in around them. The smallest pan measures 10 inches by 15 inches by 1¾ inches deep, and the largest 22 inches by 36 inches by 2½ inches deep.

Sorting Dishes of clear glass; nest of four sizes, used in connection with the dredging work of the United States Fish Commission. Made by the New England Glass Company, Cambridge, Massachusetts.

United States Fish Commission.

Crockery and earthenware dishes, of many sizes and shapes, are also employed in this work.

Naturalists' Forceps, in German silver, for use in salt water. Made by Codman & Shurtleff, Boston, Massachusetts.

United States Fish Commission.

These forceps are intended only for the coarser work of sorting zoological specimens, arranging them in jars, aquaria, &c., and were specially designed for use in salt water, in which steel forceps, even when nickle-plated, rapidly corrode. They are made of three sizes, 4, 6, and 12 inches long respectively.

Copper Tanks. Two four-gallon Agassiz tanks and one eight-gallon tank, improved pattern, in transportation box.

United States Fish Commission.

The tanks used by the United States Fish Commission and the Museum of Comparative Zoology, Cambridge, Massachusetts, for the storage and transportation of large alcoholic specimens, are made in four sizes of heavy tinned copper. They are rectangular in shape, and three of them constitute a series, the fourth being an odd size. They are furnished with two styles of covers. The larger tank of the series measures 19 inches long by 13 inches wide by 14 inches high, outside, and has a capacity of about 16 gallons. The mouth is round, and 10 inches broad, with a brass rim having a screw thread on the inner side. The cover is of tinned copper, and is also bounded with a brass rim having a screw thread to fit that of the mouth. The rim overlaps at the edges a sufficient distance to cover a rubber washer, by means of which the mouth is made tight by screwing down the cover. There is an arrangement on the top of the cover for the attachment of a handle or wrench.

The second and third tanks of the series have the same height as the above, but the former is only one-half and the latter one-fourth the other dimensions, and they have capacities, therefore, of 8 and 4 gallons respectively. The mouth of the 8-gallon tank measures 8 inches across, and that of the 4-gallon 4 inches across. For holding and protecting these tanks, especially during transportation, an uniform size of box is used, which measures on the outside 21½ inches long, 15½ inches wide, and 17½ inches high, and is strengthened with broad cleats. The cover is attached by means of iron hinges, and fastens with a hasp and padlock. The odd tank is of an elongate shape, and was specially designed for holding fish. It measures 23 inches long, 8 inches wide, and 14 inches high, and will hold about 12 gallons of alcohol. The mouth is about 6 inches in diameter.

The style of cover above described was devised by Professor Agassiz, after whom the tanks furnished with it have been named the "Agassiz tanks." A new style of cover has been recently constructed for the United States Fish Commission. It is of brass, tinned on the inside, and is cast in one piece. On one side it is strongly hinged to the top of the tank, and on the other has a projection with a screw hole, through

which works a thumb-screw passing into a screw hole in the top of the tank. A rubber washer fits under the rim of the cover. This style of cover is more easily opened and closed than the former, and in the tanks which have been supplied with it the mouth is made as large as the top of the tank will permit.

Glass Jars with Screw Covers, for the storage and transportation of specimens. Made under Mason's patent.

United States Fish Commission.

These jars are of two styles and three sizes, pint, one quart, and two quarts. Those with the smaller mouths are intended for holding preserved fruits, and those with the broad mouths for butter. By means of the rubber washer, which fits between two surfaces of glass, these jars can be hermetically sealed. They are the most reliable jars for the storage and transportation of zoological specimens, under a certain size, which the Fish Commission has yet made use of.

Cork-stoppered Bottles of clear glass, for the storage and transportation of small specimens. Made by the Dorflinger Glass Company, White Mills, Pennsylvania.

United States Fish Commission.

These bottles are made for the Fish Commission of seven sizes, ranging in capacity from one ounce to one pint.

Homeopathic Vials, set of four sizes, contained in a storage tray. Made by Whitall, Tatum & Company, Philadelphia.

United States Fish Commission.

These vials are made especially for natural history purposes, of heavy tubing, in five sizes, from 1 drachm to 8 drachms. The mouths are carefully rounded, and of uniform diameter in each size. Rubber stopples are employed, and prevent any perceptible evaporation of alcohol. The tray accompanying the vials illustrates the method adopted by the United States Fish Commission for storing vials for convenience of reference.

Glass Exhibition Jars, for the display of alcoholic specimens of aquatic animals. Made by the Dorflinger Glass Company, White Mills, Pennsylvania.

United States National Museum.

These jars are made of fifty-six sizes, and in several series, to suit the different classes of objects. They are of clear glass, and are made extra thick, to lessen, as much as possible, the danger of breakage; the stoppers are carefully ground. The smallest jar of the series is $2\frac{1}{2}$ inches high by 2 inches broad, and the largest 24 inches high by 10 inches broad. Many of the sizes are exhibited in the collections of fish and aquatic invertebrates.

APPLIANCES FOR DEEP-SEA SOUNDING.

Sigsbee's Deep-Sea Sounding Machine, for use with piano-forte wire, on the principle of Sir William Thomson. Represented by a model.

Commander Charles D. Sigsbee, United States Navy.

In deep-sea sounding with wire, the submerged weights provide a moving force for the sounding-reel containing the coil of wire. The weight of the submerged wire, and of all submerged accessories excepting the sinker, is overbalanced at discretion by means of a friction-line enwrapping a portion of the reel. Thus the motion of the reel is continued by means of the sinker and controlled by the frictional balance or brake until bottom is reached, when, the weight of the sinker ceasing to act, and the remaining submerged weights being overbalanced by the brake, the reel stops automatically. To Sir William Thomson is due the credit of having solved the problem of sounding ocean depths with wire.

To keep the wire constantly under tension is the prime essential, since a failure to maintain this condition will permit the wire to fly from the reel during the motions of the vessel in a seaway. To avoid the loss of time due to accidents or unnecessary delays is of importance in view of the expense attending the maintenance of any organization for deep-sea operations. In the Sigsbee machine every convenience and safeguard suggested by long experience has been applied, in order to economize time by rapidity of work, by lessening the probability of accident, and by making soundings practicable in any weather during which the vessel can be maneuvered. Several thousand soundings have been taken with the machine, in nearly all conditions of wind, weather, and current, much of the work having been done in moderate gales; but perhaps the most severe test was that made by Commander Bartlett in the steamer Blake. The Blake (350 tons) was hove to in a severe gale in the swift current of the Gulf Stream, in which condition she got bottom in 2,400 fathoms, and reeled in by steam without loss. Recently the Blake sounded with the same machine in 4,561 fathoms (over 5 miles), reeling in by steam and getting a specimen of the bottom deposit. The general custom in using the machine has been to employ a 35-pound lead and haul it back in depths not exceeding 1,000 fathoms, and in greater depths to use a 60-pound shot of cast-iron, detaching it on bottom. In all cases the wire has been reeled in by steam. A number of the machines are now in use by Government organizations in the United States and Europe.

A complete description of the machine and its operation is given in Sigsbee's Deep-Sea Sounding and Dredging, published by the United States Coast and Geodetic Survey in 1880, and again in 1882. The last edition contains a supplement, showing the latest improvements and the way in which the machine is folded for transportation or stowage

by the hinging of the several parts. Detailed drawings of the latest improvements are also shown in the United States exhibit. The following is a general description only:

In advance of the reel, which is practically of the Thomson pattern, are two pipes parallel to each other and about 6 feet in height, each containing a spiral extension-spring fastened at the bottom, and connecting by means of ropes taken over pulleys at the top, with a cross-head moving between the two pipes, the latter serving as guides. The cross-head contains a pulley 1 yard in circumference of rim, over which the wire leads in its passage from the reel to the water. The normal position of the cross-head is at the top of the guides, and it can be borne down only against the resistance of the springs. By this means a very sensitive *accumulator* is provided to ease the jerks upon the wire while reeling in, and which also shows by a graduated scale upon the pipes the degree of strain upon the wire at each instant during the same operation; thus the accumulator is also a *dynamometer*. An odometer attached to the axle of the cross-head pulley will give at once the number of yards of wire payed out or reeled in.

The method of reeving the friction-line through the cross-head is peculiar, advantage being taken of the presence of an accumulator to obtain an arrangement which will put any desired strain upon the friction-line without the aid of the pendulous weights previously used for this purpose. This peculiar arrangement of friction-line and accumulator also operates as a *governor* on the motion of the reel when paying out in a seaway, thus: During the downward movement of the vessel, when the strain upon the wire is suddenly eased, the reaction of the accumulator increases the strain upon the friction-line, slowing down the reel, and thereby preventing the wire flying from the drum of the reel. As the decreased speed of the reel or the rising of the vessel restores the tension upon the wire, the friction-line in turn is eased by the responsive action of the accumulator, and the reel then revolves more rapidly. At the instant bottom is reached, the accumulator, being freed from whatever force is due to the weight of the sinker, reacts instantly and transfers this force to the friction-line. The effect of this operation is to provide a safeguard at a critical moment.

The method of measuring the friction upon the reel when paying out is shown in the model on exhibition. For this purpose two spring scales are placed upon the friction-line, one in front of the reel and the other behind it. The difference between the readings of the two scales gives the frictional resistance imposed upon the reel by the friction-line. It may be said here that years of experience have shown that no means of measuring the resistance upon the reel is necessary in actual work. This may seem strange, but it is nevertheless true, as a few practice soundings will show. Where there is the slightest motion of the vessel *the controlling condition is the tension upon the wire. Keep the wire constantly under tension* is the working rule. The scales are added to the outfit more as accessories for experiment than for actual use.

Beneath the reel is a lever intended to serve as an auxiliary brake in case of accident to the friction-line. It is also useful in very heavy seas, when, by reason of the momentum of the rapidly moving reel during the violence of the vessel's movement, even the action of a governor may not be quick enough to keep the wire constantly under tension. In such a case it is well to attach a spring or rubber strap to this lever brake, causing it to press against the reel with a steady force. By this means a few pounds of reserve resistance, entirely independent of the governor, is placed upon the reel, which prevents the reel from acquiring a velocity too great for the circumstances.

In the rear of the reel is a steam engine, having a V-groove pulley on its shaft. Between the reel and the engine is a tightening pulley for a belt to be taken over the V-groove pulley and the V-groove of the reel for reeling in the wire. The tightening pulley is turned to one side or the other by turning its shaft, the latter having a locking-pin at the bottom.

In front of the accumulator guide-pipes is a fairleader for the wire, and a swivel-pulley to admit of reeling in the wire while the ship is steamed ahead on her course. While paying out wire this pulley is raised on its hinge and turned to one side. For the fairleader a *lignum vitæ* clamp is provided for clamping the wire in case of accident.

The whole machine is so hinged and arranged in its several parts that, with the exception of bolts or pins to be temporarily withdrawn, only the reel and the cross-head pulley need be unshipped in order to fold it in a very small compass for stowage. The reel then stows in the tank, which contains preservative fluid for the wire. Plates 42 and 43 of the Supplement to Sigsbee's Deep-Sea Sounding and Dredging show the machine folded, also the photographic copies of special drawings on exhibition.

The times made in actual work with this machine are shown in Sigsbee's Deep-Sea Sounding and Dredging, pp. 73–76.

Experimental form of the Sigsbee Machine for sounding with piano-forte wire. Represented by a plate (No. 7 of Sigsbee's series).

United States Coast and Geodetic Survey.

This machine was used for three years on board the Blake, previous to the construction of the improved pattern described above. It is represented in the plate as rigged for paying out.

Original Service Machine for sounding with piano-forte wire, as used on the United States Coast Survey steamer Blake during her first season in the Gulf of Mexico. Represented by a diagram, showing the machine ready for paying out (Sigsbee's series of plates, No. 6).

United States Coast and Geodetic Survey.

"This machine was practically the same as those originally issued for general use, with the sanction of Sir William Thomson. A reel, having

a drum one fathom in circumference (less the small allowance for the diameter of the wire), and with a V-shaped friction score at the side, is rigidly attached to its axle and mounted upon standards. On the axle is a worm which engages a counter or register to mark the revolutions of the reel. The wire, which is wound about the drum, pays out directly from the reel, through a fairleader or clamp on the forward end of the bed-board into the water. In the rear of the reel, and on the same side as the friction score, is a dynamometer pulley or wheel having two scores, which we will call the wide score and the narrow score, respectively. This is mounted in a special standard, from which it may be removed at will. For paying out wire, an endless rope belt, called the brake cord or the friction rope, is passed somewhat more than half around the friction-score of the reel, thence one whole turn around the wide score of the dynamometer pulley, and through a tail-block to the rear. The pendant of the tail-block, or, more strictly, pulley, being rove through a standing block, supports weights to tighten the friction rope. The narrow score of the dynamometer pulley is connected with a spring-scales by a tangent wire or cord in such a way that the traveling of the belt can turn the pulley on its axle only to the extent permitted by the resistance of the spring-scales. When the reel is set in motion, the retardation of the belt on the dynamometer pulley places a resistance upon the reel that can be regulated by weights at the tail-block. The scales are intended to show approximately the amount of resistance applied to the reel by means of the belt."

The Tanner Sounding Machine, for sounding in moderate depths of water with piano-forte wire, on the principle of Sir William Thomson.

United States Fish Commission.

This instrument works on the plan of Sir William Thomson, and is a simplification of the Sigsbee sounding machine, for use in moderate depths of water; the reeling in is accomplished by hand. It was devised by Lieut. Z. L. Tanner, United States Navy, in 1880, for the steamer Fish Hawk, then engaged in dredging along the cost, in all depths down to 500 or 600 fathoms. The reel is of tough composition, is fitted for holding a considerable supply of sounding wire, and is furnished on one side with a groove for the friction line by which it is controlled. It rests in a composition brass frame, cast in one piece, and surmounting a wrought iron standard which ships in the rail. Above the frame, into which it is fastened between two lugs, extends a curved arm of flat bar iron, carrying at its outer extremity a small, grooved, brass pulley, working in guides and suspended by a coiled spring which allows several inches of vertical play. A brass guard is fitted over the upper portion of the pulley to prevent the wire from flying off if suddenly slacked. The reel is worked by friction motion, by means of a handle or crank on each side. Both of the cranks have friction surfaces, which are brought into action by moving the right one half a revolution ahead, the left remaining clamped, or being held firmly in the hand. The re-

verse motion releases the reel and it revolves freely without moving the cranks. The register to record the amount of wire out is fastened to the frame at the left of the reel, and is operated by a worm-wheel. A small ratchet-wheel and pawl hold the reel in place when desired. The reel is unshipped by simply unscrewing one nut on the left crank, which releases the shaft, allowing it to be withdrawn, and leaving the ratchet, worm-wheel, and left crank in position. By means of a tackle designed for this purpose, one man can easily ship and unship the reel.

"The guiding pulley carries a small arm near the upper end of its shaft or spindle, which works through a slot in the casting. A small cord is attached to the arm and made fast to the free end of the friction rope, the standing part being hooked to a small metal eye in the frame over the reel. By this arrangement the friction is intended to act automatically in the following manner: The machine being ready for a cast, the small friction line is hauled taut before the lead is bent, and while the guiding pulley is up in its place. In this condition it requires a strong man to move the reel, but, the lead being bent and suspended, it compresses the spring and drags the pulley down sufficiently to slacken the friction rope and allow the reel to move with comparative freedom. The instant the lead strikes bottom, however, or the weight is removed from any cause, the pulley flies up, putting a strain on the friction rope, which stops the reel at once. It acts also as a check in paying out, the friction being governed by the weight suspended on the guide pulley, it being necessary to keep the sounding wire under constant strain, like the spring of a clock."

The original machine constructed by Lieutenant Tanner had a reel measuring only 11.43 inches in diameter, with a carrying capacity of 600 fathoms of wire. One turn around the reel was equal to half a fathom, and the entire apparatus weighed 96 pounds. Ordinary sounding leads of 12 to 20 pounds weight were used. The machine in regular use during the past two years has been considerably larger, the reel having twice the diameter, and space for 2,000 fathoms of wire. It weighs 128 pounds, and contains many improvements over the smaller machine, as described above. The example displayed is of this pattern. The smaller machine is still used at the stern of the Fish Hawk, with Basnett's patent atmospheric lead, by means of which slight depths may be measured while running at full speed. The positions assigned to the sounding machines on the steamer Fish Hawk are illustrated in the enlarged photographic views of that steamer.

Sigsbee's Correction Curve, or method of ascertaining the true depth from the reading of the register applied to the reel in sounding with wire.

Commander Charles D. Sigsbee, United States Navy.

Although this is only a method, and is represented simply by a plate, attention is called to it because of the great amount of labor saved by

its use. A curve of this kind is easily made, and once obtained no further measurements of wire are needed so long as the same kind of reel and wire are continued in use. The loss of wire from the reel, or the addition of wire thereto, does not require a new curve if the curve be made long enough in the first instance. It is believed that it is now in use wherever known. For a full description, see Sigsbee's Deep-Sea Sounding and Dredging, page 37 and Plate 41.

The necessity for its use appears from the following: Reels for deep-sea sounding are made of such a size that their drums will exactly accommodate one fathom of the sounding wire at a single turn (although this is not essential). While each turn of the first layer wound about one of them is, therefore, one fathom in length, those that are above the first layer measure more, according to their distance from the drum. Each reel is rigidly attached to an axle, on which is a worm to connect with the train of a register for recording the number of revolutions of the reel. It is evident that the readings of the register show the number of *turns* of wire paid out or reeled in, but not the number of *fathoms*; and since the turns are almost constantly varying in length, it becomes necessary to have some ready means of reducing them to fathoms, in order to arrive at the depth of the sounding.

With a correction curve at hand, the number of *turns* of wire in use upon the reel and the number of *turns* paid out at any sounding are referred to the curve, whence the corresponding *fathoms* are found in a few seconds. Plate 41 of Deep-Sea Sounding and Dredging explains the construction and the method of reading the curve.

Steel Piano-forte Wire, for deep-sea sounding.

United States Fish Commission.

"The wire used by the American expeditions for sounding purposes is steel piano-forte wire, of No. 22 Birmingham (Stubb's) gauge, or about No. 21 American wire gauge, and measures 0.028 of an inch in diameter. It weighs 14½ pounds to the nautical mile (1,000 fathoms approximately) in air, and consequently about 12 pounds in water. The English-made wire has a tensile strength of from 200 to 240 pounds, is provided in lengths of 100 to 400 fathoms, and is made up in 18-inch coils, weighing about 60 pounds, and wrapped with oiled paper. The American wire, called music wire No. 13, has a tensile strength somewhat less than that of the English wire, and seems to have a higher polish. It is made up in 9 or 10-inch coils, stowed neatly within sealed tin cases, which protect it better than the English wrapping." Great care is required in the preservation of the wire to prevent corrosion. When not in use the sounding reel with its wire is kept in a tank of sperm or lard oil, free from acid impurities. One of the greatest difficulties originally encountered in the use of considerable lengths of sounding wire was the construction of suitable splices, which should be

of equal strength to the wire itself. This has been overcome by the American expeditions in the manner described below.

A piece of small rope, called the stray line, and measuring from 10 to 15 fathoms in length, is spliced to the lower end of the wire for the attachment of the sinker. It is discussed farther on.

The following account of the method of protecting the wire during storage is taken from Commander Sigsbee's description: "When the wire was received in sealed tin cans, the latter were painted and stowed below in a safe place, after which only an occasional inspection or touching up of the outside of the cans was necessary. When it was supplied to us in coils, wrapped with oil paper, we would parcel each coil with soft canvas and then apply several coats of paint before stowing them below. Once when we wished to stow away a spare reel containing several thousand fathoms of wire, and had no tank available, we left the coil upon the reel, covered the upper layers with old washed flannel saturated with sperm oil, spread tallow over the flannel to a depth of half an inch, and then wrapped the whole reel in old canvas and stowed it below in a cool place. Our methods in this respect answered the purpose for which they were intended. * * * A simple method of stowage and supply of wire would be to transfer the commercial coils, as soon as they are received, to special cast-iron reels or drums, capable of holding four or five times as much as the ordinary sounding reels. In winding the wire to the supply-drums the splices might be completed at once, which would give the advantage of always having the supply in very long lengths, from which losses could be quickly replaced at sea or in port. These drums, when wound with wire, might be kept in tanks of oil or lime-water. * * * The winding of the wire from a turn-table is a slow operation and can best be done in port.

"The preservation of the wire when on the working reel is an important point, but presents no serious obstacle to the use of wire for sounding. When not on our lines the sounding-reel and its wire were kept in a cylindrical tank of galvanized sheet-iron, containing sperm oil. The tank is built up inside so that, as nearly as possible, there is but a film of oil beneath and at the sides of the reel, while on top it is covered to a depth of about one or two inches. The cover is a flat, circular piece of sheet-iron, riveted all around its edge to the under side of a wrought-iron ring, the latter being perforated to receive screws projecting at regular intervals through a second wrought-iron ring or flange, fastened around the inside of the top edge of the tank. In the center of the cover is a square hole, through which the axle of the reel is allowed to project. A sheet-iron cylindrical water-tight cap, to fit over this hole, is a desideratum. It should be about 6 inches in diameter and 4 inches high, so as to cover the stray line, which, being connected with the wire, is rove up through the central hole and coiled down upon the tank when the reel is stowed. The cover of the tank when in place is set up firm

by means of thumb screws, and between the two wrought-iron rings, already mentioned, which form the joint, a washer of rubber or sennit is interposed to prevent leakage of the oil in a sea-way."

A model of this storage tank is exhibited in connection with the Sigsbee deep-sea sounding machine.

Splices in Sounding Wire. Samples showing the method of splicing the sounding wire together and to the stray line, as employed by the United States Coast and Geodetic survey.

Commander Charles D. Sigsbee, United States Navy.

The method of splicing the sounding wire employed on the steamer Blake was devised by commander J. A. Howell, United States Navy, and is as follows:

Overlap the ends of the wire at least a foot; cross them and wrap each free end tightly about the opposite wire in a close spiral twist, making the whole splice about 3 inches long. Although the spirals should begin close up to the cross, the "nip" of the latter should not be so abrupt as to weaken the wire by torsional strain. Plate 41 will serve as a model. Rub the whole splice with resin or soldering fluid, preferably the latter, and apply soft solder over all, either with a soldering iron or as follows: In a block of wood cut a groove, in which melt the solder; then draw the splice to and fro in the groove. Scrape or file off any superfluous solder, but caution must be exercised in using a file. In using a soldering iron care must be taken not to overheat the wire. At the end of each spiral the solder should be gradually tapered from the thickness of the spiral to the thickness of the single wire, to avoid a sudden change in area of cross-section, which would cause weakness. These splices are neat and compact; they are quickly made and have been used in thousands of casts, down to a depth of more than 5 miles.

The sounding wire is spliced to the stray line in the following manner, introduced by Commander Sigsbee:

"To splice the wire into the stray line, make a single wall knot in the latter, and whip the rope with twine for a half inch below the knot; tuck the end of the wire down through the middle of the single wall, and complete the knot by jamming the strands, working close down to the whipping. Beginning close up under the knot, take ten or twelve turns of the wire around the rope against the lay; then tuck it through under a strand, and make another set of turns below the first set, this time with the lay of the rope; then tuck and repeat against the lay, and expend the end of the wire. Taper and whip the ends of the strands about the wire above the knot and the splice will be complete."

These splices have been used successfully on the Blake for a number of years. It is best that they should not be as strong as the wire itself, in order to afford a chance of parting at the stray line, should the rod or lead foul irretrievably on the bottom. On the Blake the

stray line was usually made 10 or 12 fathoms long, and from any small stuff less than one-quarter of an inch in diameter.

The operation of making the above splices is clearly illustrated on Plate 41 of Sigsbee's "Deep-Sea Sounding and Dredging."

Splices in Sounding Wire. Samples showing the method of splicing the sounding wire together and to the stray line, as employed on the steamers Fish Hawk and Albatross.

United States Fish Commission.

The method first adopted by the United States Fish Commission is as follows: "The ends of the wire for about 2 feet are thoroughly cleaned and laid together with about eight turns. The ends and one, two, or three intermediate points are then wound with a few turns of very fine wire and covered with solder, which is carried along the entire length of the splice and smoothed with a knife or piece of sand-paper. This form of splice is smooth, flexible, and reliable. The stray line, consisting of a piece of slack-laid cod-line, is applied to the wire in the following manner: The end of the wire is stuck twice against the lay, about 6 inches from the end of the line, then passed with the lay for 6 inches, the end stuck twice against the lay and served over with seaming twine. The wire is then passed with the lay to the end of the line, the strands trimmed down and served over with twine; a seizing is also put on over the wire first stuck against the lay. This makes a smooth and secure splice, which passes readily over the guide pulley without danger of catching under the guard."

During the summer of 1882, a simpler form of splicing the wire was introduced as follows: The two ends are overlapped for about 2 feet and twisted together with about four turns. These portions are thoroughly cleaned by means of emery paper and a weak solution of muriatic acid, tinned their entire length, and pointed at the tips. The two tips are then closely wrapped to the adjacent wire for a length of about three-fourths of an inch, with the finest steel or iron wire, and the entire splice covered with solder which is smoothed down with a piece of cloth or emery paper.

Quite recently Lieut. S. H. May, United States Navy, of the steamer Albatross, has devised another and still more simple splice, which seems to answer every requirement. The ends of the wire to be spliced are heated for a distance of about an inch and a half in the flame of a spirit lamp or candle until they become of a cherry red, and the tips filed down to sharp points. The ends are then lapped a distance of about 4 inches, and wrapped about one another with about three or four turns, after which the splice is covered or united with soft solder and finished down with sand-paper. Muriate of zinc is used as a flux.

All of the above splices are exhibited, both in the finished state and in process of construction.

Steel Wire used in taking serial temperatures.

United States Fish Commission.

When several thermometers are to be used, attached to the same sounding wire, for taking serial temperatures in the sea, their combined weight is too great to be trusted to the ordinary sounding wire of No. 21 gauge, and a heavier wire is employed. For this purpose the United States Fish Commission has made use of No. 18 wire, American gauge, which has a tensile strength in air of about 600 pounds. The Tanner sounding machine exhibited, is furnished with this size of wire.

Sounding Leads used in connection with steel sounding wire. Actual lead for recovery, and photographs.

United States Coast and Geodetic Survey and United States Fish Commission.

The sounding leads used by the United States Fish Commission in connection with the steel wire, down to depths of 800 fathoms, are of the ordinary commercial pattern for recovery, with a concave lower end to hold the tallow arming for obtaining a sample of the bottom. They weigh from 12 to 20 pounds. The lead attached to the Tanner sounding machine exhibited weighs only 10 pounds. The same style of lead is also employed by the United States Coast Survey for similar depths, but it is furnished with the Stellwagen cup (Sigsbee's Plate, No. 7) for obtaining specimens of the bottom. This cup consists of "a wrought iron spindle, sunk for a part of its length into the sounding lead, and with a detachable, conoidal cup screwed to its lower end. Sliding freely on the spindle, between the lead and the cup, is a leather washer, which is raised by the resistance of the water in the descent or by the resistance of the soil on striking bottom. On the ascent the washer falls by its own weight, or by the resistance of the water is forced down upon the cup, thus enclosing the specimen. A second washer of lead was generally used above the leather, and sometimes a piece of muslin was gathered and seized around the spindle above the washers, allowing its folds to drape down around the washers and cup, nearly to the bottom of the latter. This was intended to prevent a current of water between the spindle and the washers, and the tendency to wash out the specimen."

The sinkers for detaching, used on board the Blake in connection with sounding rods, are cast-iron shot, with a hole of sufficient size to give a clearance of one-sixteenth of an inch all around the rod, and weighing about 60 pounds each (Sigsbee's plate, No. 39).

Sigsbee-Belknap Sounding Rod.—Consisting of Commander Charles D. Sigsbee's detacher in connection with his modification of Capt. G. E. Belknap's (U. S. N.) sounding cylinder No. 2.

Commander Charles D. Sigsbee, United States Navy.

The subject of sounding rods, with especial reference to this rod, is discussed in Sigsbee's Deep-Sea Sounding and Dredging, pp. 39–51, the

Belknap cylinder No. 2 being shown in a foot-note on page 44. In that discussion the following are named as amongst the requirements of a perfect sounding rod for work with wire:

1. Certainty of not detaching the sinker during the descent.
2. Certainty of detaching on striking any character of bottom.
3. Certainty of not rehooking or of fouling with the sinker in any way after the same has once been tripped.
4. Adaptability to getting a specimen from the various kinds of bottom material.
5. Certainty of not grappling irretrievably with the bottom.
6. Certainty of retaining the specimen against the wash of water in the ascent.
7. Handiness for extracting the specimen and for cleaning the parts of the rod.
8. Freedom from changing its form under the severe pressure in deep water.
9. Strength, simplicity, cheapness, light weight, and freedom from corrosion.

In the Sigsbee-Belknap rod it has been attempted to cover these points. While the rod might be made lighter, its great strength serves a good purpose on hard rock. In his efforts to obtain a good form of sounding rod—one that would require but little watchful care in its operation—Commander Sigsbee, after much practice and experiment, decided to modify Captain Belknap's cylinder No. 2, and to apply his own detacher to this modification. The results with this rod have been most gratifying after more extended use than has probably ever been given to any other rod in sounding with wire. Commander Bartlett was the first to use it, in 1878–'79; on his first cruise he used it 250 times, and in no instance did it fail. Since that it has been used in hundreds of casts, and no complaints have been made of its operation. With the rod itself, and detailed drawings on exhibition, no special description of the rod is deemed necessary in this catalogue.

APPARATUS FOR PHYSICAL OBSERVATIONS, &c.

The Bailie-Tanner Thermometer Attachments, for serial and deep-sea temperatures, with the Negretti and Zambra deep-sea thermometers.

United States Fish Commission.

Case for use with a messenger.—The Negretti and Zambra deep-sea thermometers, which register by tripping, were adopted for use by the United States Fish Commission in 1878, and have been employed since then in all the explorations of that survey. During the first two years, the wooden case with shifting weight furnished by the makers was the only one used, but it frequently proved unreliable, especially when the vessel was rolling much. In 1880, Lieutenant Tanner, United States

Navy, constructed a metal case or cylinder for holding the thermometer tube, which could be tripped by means of a messenger sent down the wire from the steamer. More recently this same case has been perfected by Passed Assistant Engineer W. L. Bailie, United States Navy, who has added a clamp at the lower end for attaching it firmly to any part of the sounding wire.

The examples displayed are of the latest pattern. They consist of a brass tube about 11 inches long and seven-eighths of an inch in diameter inside, with slits on two opposite sides 5½ inches long by half an inch wide, through which the mercury and scale of the thermometer can be seen. The lower end of the tube, which is open, is pierced on the sides with four longitudinal rows of three holes each for the freer entrance of water, and terminates on one side in a hook for the suspension of a messenger. The clamp for the fixed attachment of the tube to the sounding wire is fastened to the upper part of the hook. It consists of a square piece of brass, raised on one side to form a flange or groove, into which a quadrant of an eccentric curve fits snugly against the sounding wire, being controlled by a stiff spring. The upper part of the case is fitted with a "messenger head," designed by Lieutenant Tanner, and consisting of a tube 2 inches long, which screws onto the main tube. It is furnished on top with a perforated screw cap, and has a slot on one side three-fourths of an inch long but of different widths, the upper one-third or slightly more being three-eighths of an inch wide and the lower two-thirds five-eighths of an inch wide, the sides of the slot curving abruptly from the lesser to the greater width. The slip hooks, for the attachment of the upper part of the case to the sounding wire during its descent through the water, pass through the slot, are 1½ inches long and project three-fourths of an inch outside. Their exposed portions are curved so that they meet only at the tips, leaving quite an open space within. They are held in place by a brass pin, which passes loosely through their inner ends, and fastens into the sides of the messenger head. A double wire spring, making three turns around the supporting pin on each side of the hooks, and passing underneath the hooks in front of the pin, forces the former up into the narrower part of the slot, in which they fit snugly and are held closely together. A strong pressure or blow from above throws them into the broader part of the slot where they readily open. The messenger is an elongate piece of round brass, 1¾ inches long by 1 inch in diameter, and is bored with a three-fourths inch hole. It is rounded at both ends and furnished with a bale above for suspending it; its weight is about 6 ounces. The entire case is of brass.

To prepare the case for use, a Negretti and Zambra deep-sea thermometer is passed into the long tube, where it is held in place by means of two rubber bushings. The sounding wire is fastened into the lower clamp and passed through the open space between the slip hooks, which are then allowed to come together at the ends. A messenger has been

previously placed upon the sounding wire, and hangs suspended from a hook attached to the guiding pulley of the sounding machine. The thermometer is now lowered in the ordinary way, and after it has been down a sufficient length of time the messenger is dispatched with a quick throw. No failure to trip the thermometer by this means has been noted since the introduction of this style of case. It has been used successfully and repeatedly down to depths of 700 and 800 fathoms, but in very deep water too much time would be required for the downward passage of the messenger, and for such purposes an automatic attachment is substituted for the messenger head.

The weight of this case is such that, having once tripped, no movement of the vessel while rolling can cause it to revert to its original upright position, even for a short interval of time. For taking serial temperatures, as many of these cases as are required may be attached to the same sounding wire, and arranged at suitable distances apart. The same number of messengers are strung upon the wire, the upper one being suspended from the sounding machine and the remainder in succession from the hook of each thermometer case, excepting the lower. The tripping of the upper case frees the messenger hanging from it, which falls to the second case, and so the action continues to the end of the series. When taking serial temperatures the larger size of sounding wire, (No. 18, American gauge), elsewhere described, is necessary to sustain the extra weight of the several thermometer cases.

Automatic attachment.—The automatic attachment devised by Mr. Bailie replaces the messenger head on the above-described case, when working in such depths of water that too much valuable time would be lost in the descent of a messenger. It consists of a cylinder 3 inches long by 2 inches across outside, containing a spindle furnished about the middle with three curved propeller blades, each $1\frac{3}{8}$ inches long and three-fourths of an inch broad. The cylinder is fitted above with an open-work screw cap, having a nut in the center; below it is cut broadly away on two sides, to permit of the free entrance of water, and is joined to a smaller cylinder, about $1\frac{3}{4}$ inches long, which screws onto the tube containing the thermometer. The slip-hooks are hinged together in the center, pass out through a large square slot in the side of the smaller cylinder, and are closed at the points by being pressed together at their inner ends, the reverse action allowing them to open. The spindle, which extends vertically through the larger cylinder, is furnished with a screw thread above the blades, by means of which it screws up and down through the nut in the cap. The lower part of the spindle is 2 inches long and smooth; for the upper $1\frac{1}{2}$ inches of its length it is over one-fourth of an inch thick, but beyond that it rapidly diminishes in size to a diameter of less than one-eighth of an inch. This termination of the spindle is called the cone end. The entire lower portion of the spindle, below the blades, is free to enter the smaller cylinder through a small hole in the top, providing no obstruc-

tion is interposed. It passes between the inner extremities of the slip-hooks, and controls their opening and closing. When the spindle is screwed up so that the blades are close to the cap, the smaller or cone end of the spindle is between the hooks, and allows them to open freely. As the motion of the spindle is reversed, however, the broader part is gradually forced between the hooks, causing their outer ends to come together and bind closely. A fulcrum attachment above the hooks permits of their being raised and opened, even when they are otherwise locked by the spindle, for the purpose of inserting the sounding wire. In the water the movements of the spindle are entirely controlled by the propeller blades.

To prepare for use, the sounding wire is clamped at the lower end of the case, as before described, and passed through the opening between the slip-hooks, which are locked by screwing down the spindle. The case is now ready for lowering. As it passes down through the water, the upward current produced through the cylinder tends to keep the hooks locked by the force it exerts against the blades. As soon, however, as the reeling in begins the direction of the current is changed, the blades revolve in the opposite way, screwing the spindle up through the nut until the cone end comes between the hooks, when the latter open, release the wire, and the tripping is accomplished. Again, the relative direction of the current is altered, and when the case reaches the surface the hooks will be found locked and ready for use without the necessity of screwing down the spindle by hand, the fulcrum attachment furnishing the means of opening the hooks for the insertion of the wire. Were the blades given free play through the entire length of the cylinder, they would require to traverse about fifty fathoms before loosening the hooks. This extreme amount of play is allowed to insure against the tripping of the case by the violent pitching or rolling of the ship, and may be lessened to trip in any distance, down to one fathom, by means of a long, slender screw which enters the cylinder from below on one side. To further insure the propeller blades recovering in descent all the revolutions expended in the upward motion of the ship, in rolling or pitching, the blades are bent over at the top a distance of about one-eighth of an inch, at the same angle as the blades themselves, thus giving them more pitch with the current from the bottom than from the top, and compensating for the oblique action of the water through the broad slots at the lower end of the cylinder.

This style of thermometer case may be used as the upper one of a series for taking serial temperatures in deep water, the others being of the first described pattern and tripping in the same way.

Sigsbee's Water Specimen Cup, for obtaining specimens from a number of depths at a single haul.

Commander Charles D. Sigsbee, United States Navy.

It is believed that this is the only cup ever devised for this special purpose. A discussion of the cup and its operation is contained in Sigs-

bee's Deep-Sea Sounding and Dredging, published by the United States Coast and Geodetic Survey, in 1880 and in 1882, pages 90 to 98. The following description and explanation will give a general idea of the invention:

Parts of the cup.—A cylinder; a lower valve-seat which screws to the cylinder by a right-hand thread; a detachable upper valve-seat, detachable to allow the removal of the upper seat for cleaning; upper and lower poppet valves connected by an adjustable stem; a frame fastened to the cylinder with a left-hand thread, inclosing the upper valve-seat; a shaft with two sets of external screw threads; a propeller composed of two bent blades; a hub having an internal screw thread, a removable cup, and two beveled lugs; a screw cap or follower with milled head, two beveled slots, and internal screw threads; a removable sleeve and locking pin; a binding clamp, composed of a single wire lever, a pivot screw, and two contact lugs. The delicate working parts are of German silver, which does not corrode in sea water. All delicate screw threads are inclosed, as a protection against fouling by grit, &c.

Working.—The cup comes to the surface filled with water, the screw-follower down upon the upper valve, and the propeller resting upon the follower. To remove the water first screw up the propeller until it takes on the thread of the shaft; then screw up the follower until it uncouples from its thread. The valves may then be raised and the water discharged.

After the follower has been uncoupled the cup is automatic in its working, and it is only necessary to clamp it on the line with the spring binding clamp. Before paying out, the propeller may be screwed up to its fullest extent, but this is not necessary. As the cup descends the resistance of the water raises the valves, and also screws up the propeller until the lower thread in the hub clears the upper thread on the shaft, when the propeller uncouples and revolves freely on the shaft, where it is guided at top and bottom, which prevents chafe on the thread. Should a stoppage then be made to fasten on another cup, the propeller will not screw down by the rolling or pitching of the vessel.

It will be noticed that the blades are bent on their upper edges. With the blades thus bent, and the propeller made very light,* it has been found, experimentally, that by rising and falling equal distances through the water the propeller will screw up instead of down. Unless the propeller blades were bent, it is evident that the propeller would gradually screw down by a rising and falling motion, since its weight would aid in screwing down and resist in screwing up; but, even thus, experiments have shown that for an alternating motion through the water, continued for a longer time than any probable stoppage, the propeller would screw down only about a quarter of an inch, which is

* The propeller might be made of aluminum.

much within the margin of safety; and on relowering, the propeller in that case would again rise and uncouple. However, the bending of the blades overcomes any bad effects from the motion of the vessel, and the valves are free to open during the whole descent without regard to the number of stoppages made. At any stoppage each cup has within its cylinder a specimen of the water from the place where it stops.

On hauling in, the propeller of each cup screws down, by the resistance of the water, until the upper thread of the hub clears the lower thread of the corresponding screw on the shaft, when the propeller drops on the screw-follower, which until that time has been at rest, the lugs of the propeller clutch into the slots of the follower, and the latter is screwed down until it touches the upper valve, thus closing both valves. It is evident that the follower can be got out of this second position only by hand, for the lugs and slots being beveled the former can clutch the follower only in one direction. The resistance of the water, which would reverse the propeller at a stoppage on the ascent, would also lift the propeller clear of the screw-cap. If each propeller were regulated to close down the follower in passing through equal distances in water, each cup would be locked when the cup had passed through that distance after the beginning of the ascent. The follower is found screwed down so tight in coming out of the water that it can be set no tighter without endangering the thread. This favorable result is doubtless due, to some extent, to the expansion of the several metallic parts after leaving the frigid water of the lower depths.

Water Specimen Cup, for obtaining a single specimen at each haul, used by the United States Coast Survey before the invention of Sigsbee's water specimen cup. Represented by a diagram (Plate 19, of Sigsbee's series).

United States Coast and Geodetic Survey.

The structure of this cup is clearly shown on the plate. It is furnished with independent poppet valves, which are free to open and close at all times.

Hilgard's Ocean Salinometer, for determining the density of sea water by means of a glass float.

Prof. J. E. Hilgard, Superintendent United States Coast Survey.

"This instrument consists of a single float, about 9 inches in length. The scale extends from 1.020 to 1.031, in order to give sufficient range for the effect of temperature. Each unit in the third place, or thousandths of the density of fresh water, is represented by a length of 0.3 of an inch, which is subdivided into five parts, admitting of an accurate reading of a unit in the fourth place of decimals by estimation. The float is accompanied by a copper can, with a thermometer inserted within the cavity, which is glazed in front. In use, the can is nearly

filled with water, so as to overflow when the float is inserted, the reading being then taken with ease at the top of the liquid. For convenience and security two such floats and the can are packed together in a suitable case, and a supply of floats and thermometers, securely packed in saw-dust, is kept on hand to replace the broken ones."

Hilgard's Optical Densimeter, for determining the density of sea water by means of a prism.

Prof. J. E. Hilgard, Superintendent United States Coast Survey.

"* * * When we get away from local conditions and inquire into the general regimen of the ocean, affected in part by the fresh water outflow from the continents, but mainly by the general thermal circulation, it becomes important to measure the differences of density with the greatest precision that can practically be obtained. * * * The method of ascertaining the density with hydrometers does not permit of great precision on shipboard, because the float partakes of the movements of the vessel, and oscillates between wide limits—wider in proportion to its sensitiveness, and generally unconformable to the oscillations of the ship. Hence it becomes very difficult to read the average position of the float with a sufficient degree of precision unless the sea be exceptionally calm. * * *

"With this view the optical densimeter has been devised, which obviates all the difficulties arising from the movement of the vessel. The basis of this instrument is the change in the refractive power of a saline solution of greater or less density. The instrument consists, substantially, of a hollow prism filled with the water under observation, transmitting from a collimating telescope a line of monochromatic light to an observing telescope, in which the refracted position of that line is read by means of a micrometer. The monochromatic light employed is a sodium flame, obtained by adding a small proportion of a solution of common salt to the alcohol of the lamp. The temperature of the liquid under observation is found by means of a thermometer inserted through the neck of the hollow prism, but which is withdrawn when the optical observation is made.

"The glass prism rests on three little knobs, so as to have a firm support. Attached to the stand carrying the telescopes are two guides, by means of which the prism is made always to occupy exactly the same position, so that all observations are made under the same angle. A small thumb-screw on the side of the prism forces it closely into the guides. It is obvious that the sensibility of this apparatus is not affected by the movements of the vessel, and that its power of measurement might be increased, by either enlarging or increasing the power of the telescopes or by introducing an additional prism. But it will be seen at once that the practical accuracy is limited to the ascertainment of the temperature at which the observation is made."

Cans for observing Ocean Currents, devised by the late Professor Henry Mitchell. Represented by a diagram (Sigsbee's series of plates, No. 5).

United States Coast and Geodetic Survey.

"The two cans are made of galvanized sheet iron, and are of the same shape and size—a cylinder, 11 inches long by 8 inches in diameter, the upper being surmounted by a cone, 3 inches in height. At the top of each is a small aperture. In use, the aperture of the lower can is kept open for the entrance of water, to facilitate the sinking of the can and prevent its being crushed under pressure, while that of the upper can is kept closed by a cork, no water being admitted. The cans are connected by a length of sounding wire (diameter .028 inches), and are so loaded with old scraps of lead or iron, or with pebbles, that when set adrift the lower can will sink to the full extent of the connecting wire, while the upper can will be submerged only to the base of its conical top, thus making the submerged surface of the two cans equal. For observing surface currents, the lower can is sunk to a depth of one or two fathoms, simply to counteract the effect of wind and surface wash on the floating can. For subsurface currents, it is lowered to the depth at which it is desired to know the current, the distance being regulated by the connecting wire. To the upper can is attached a graduated line, marked for knots and tenths, the length of each knot being 50.7 feet, to correspond to a time interval of 30 seconds. Sometimes a few fathoms of stray-line are interposed between the floating can and the initial mark, the last being a white rag. Observations are made from the boat, as a station point; those for velocity being made after the manner of observing the speed of a vessel with the log chip. The direction of the movement of the can is obtained by compass from the station point."

MARINE ZOOLOGICAL STATIONS.

The Agassiz Zoological Laboratory, at Newport, Rhode Island, for advanced students in biology. Represented by plans.

Alexander Agassiz.

In establishing this laboratory Mr. Agassiz says, "I hope, by giving facilities each year to a few advanced students from the Museum (of Comparative Zoology) and teachers in our public schools, to prepare, little by little, a small number of teachers, who will have had opportunities for their studies hitherto unattainable."

His description of the laboratory is as follows: "The new laboratory erected by me at Newport is 25 feet by 45. The six windows for work are on the north side, and extend from the ceiling to within 18 inches of the floor. In the spaces between the windows and the corners of the building are eight work tables, 3 feet by 5, covered with white tiles, 1 foot of the outer edge being covered, however, with black tiles for

greater facility in detecting minute animals on a black background. Between the windows movable brackets with glass shelves are placed; while similar brackets extend across the windows and between the tables, thus providing a shelf at any desired height. The tables for microscopic work are three-legged stands of varying height, adapted to the different kinds of microscopes in use. The whole of the northern side of the floor, upon which the work tables and microscope stands are placed, is supported upon brick piers and arches, independent of the main brick walls of the building, which form at the same time the basement of the building. The rest of the floor is supported entirely upon the outside walls and upon columns with stretchers extending under the crown of the arches reaching to the northern wall. This gives to the microscope work the great advantage of complete isolation from all disturbance caused by walking over the floor. This will be duly appreciated by those who have worked in a building with a wooden floor, where every step caused a cessation of work, and was sure to disturb any object just at the most interesting moment. The floor is cemented and covered by a heavy oil-cloth. The center of the large room is occupied by a sink, on each side of which extend two long tables, 3 feet by 12. These are covered with different colored tiles, imitating mud, sand, gravel, sea-weed, black and white tiles, as well as red, yellow, blue, green, violet, to get all possible variety of background. A space at each end is covered with a glass plate, allowing the light to come from underneath, thus enabling the observer to examine larger specimens from the underside, without disturbing them when fully expanded. Two shorter and narrower tables, 18 inches by 7 feet, are placed half way between these central tables and the southern face of the building. These tables are intended for larger aquaria or dishes, and are covered with common marble slabs. There is a blank wall on the south side, the whole of which is occupied by closets and shelves for storing glass jars, reagents, bottles, dishes, &c. A space is devoted to books. The basement is used for the storage of alcoholic specimens, dredges, trawls, and other similar appliances. In the attic there is a large tank for salt water, and another for fresh. The rest of the attic will be eventually devoted to photographic rooms and room for an artist. The laboratory is supplied with salt water by a small steam pump, driven by a vertical boiler of 5 horse-power. This is kept going the whole time, day and night, the overflow of the tank being carried off by a large pipe. The water is taken some distance from the laboratory, and drawn up at a horizontal distance of 60 feet from the shore in a depth of some 4 fathoms, the end of the section pipe standing up vertically from the ground a height of 5 feet, and terminating in an elbow to prevent its becoming choked. The water is led through iron pipes coated inside with enamel. From the tanks the salt water is distributed in pipes extending in a double row over the central tables, over the long narrow tables for aquaria, and along the whole length of the glass shelves on the south wall.

Large faucets to draw off salt water are placed at each sink; and by a proper arrangement of valves it is possible to lead fresh water to a part of the pipes in case it is needed. The pipes leading over the tables and shelves are provided with globe valves and nozzles, to which rubber pipes can be attached and the water led to a vessel below. There are fifty such taps, each of which can supply water or air to at least three or four jars. The overflow runs into gutters laid alongside the tables, leading into the main drain pipe. To aerate the salt water, I use an injector invented by Professor Richards, of the Institute of Technology. This can be used to supply aerated water directly to the jar by providing it with a siphon overflow, or the aerated water can be collected in a receiver, from which air alone is then led to the jar. This latter course is the only practical one for delicate specimens, and for the bulk of the work of raising embryos. The east and west sides have large windows and doors provided with blinds. They always remain open, with the blinds closed to keep out sunlight, and serve to ventilate the laboratory thoroughly. Large tables for dissection, covered with slate, and adjoining a sink provided with fresh and salt water, are placed across the windows of these sides."

MAPS, MODELS, AND COLLECTIONS OF NATURAL HISTORY, ILLUSTRATING RESULTS OF EXPLORATIONS.

Relief Model of the western part of the North Atlantic, from Newfoundland to, and including, the Gulf of Mexico; based principally upon recent explorations by the United States Coast Survey steamer Blake and the soundings of H. M. S. Challenger, in 1873. Constructed under the direction of J. E. Hilgard, Superintendent of the United States Coast and Geodetic Survey, by A. and H. Lindenkohl, 1883.

Horizontal scale, $\frac{1}{2400000}$; vertical scale, 1,000 fathoms to one inch.

Relief Model of the Gulf of Maine, based upon the soundings of the United States Coast and Geodetic Survey, and constructed for the United States Commission of Fish and Fisheries, by A. and H. Lindenkohl, 1883.

Scale, $\frac{1}{600000}$. The signs "+" denote dredging stations of the United States Fish Commission, from 1871 to 1882.

Relief Model of the off-shore fishing-banks of Eastern North America, from New York to the eastern edge of the Grand Banks. Constructed for the United States Fish Commission by A. Lindenkohl.

Horizontal scale, $\frac{1}{1200000}$; vertical scale, $\frac{1}{72000}$; ratio of horizontal scale to vertical as 3 : 50.

Series of Charts and other Publications of the United States Coast and Geodetic Survey, showing sounding and dredging operations, &c. (For list see elsewhere in catalogue.)

Series of Charts of the Hydrographic Bureau, United States Navy, showing sounding operations. (For list see elsewhere in catalogue.)

Chart of Bering Strait, showing the surface isotherms observed in August and September, 1880, and the vertical isotherms observed September 5, 1880, by W. H. Dall, assistant, United States Coast and Geodetic Survey, in charge of the United States Coast Survey schooner Yukon. Published by the Survey.

Chart of Currents in Bering Sea and adjacent waters, 1881, compiled from various sources by William H. Dall, assistant, United States Coast and Geodetic Survey. Published by the Survey.

Twelve charts, showing the isobars in Alaska and adjoining region for every month of the year; twelve charts showing the isotherms for the same region and period; and four charts showing, for the same region, the curves of mean annual pressure, curves of mean annual temperature, distribution of plants and animals, and summer sea-surface temperatures and limits of trees, by William H. Dall, acting assistant, United States Coast and Geodetic Survey.

Published by the United States Coast and Geodetic Survey, Carlile P. Patterson, superintendent, in the Pacific Coast Pilot. Coasts and islands of Alaska. Washington, 1879.

Chart showing the dredging operations of the United States Fish Commission from 1871 to 1882, inclusive; compiled by Sanderson Smith.

The dredging stations are marked in red. Of the 1,700 hauls made during this period only about one-fourth are indicated, the remainder being in shallow water and in close proximity to others which are marked.

FISHES.

The catalogue of the marine and fresh-water fishes, showing results of investigations in that department, are given elsewhere, in a separate section, by Dr. Tarleton H. Bean.

*COLLECTION OF MARINE INVERTEBRATES FROM OFF THE EASTERN COAST OF NORTH AMERICA, ILLUSTRATING RECENT EXPLORATIONS BY THE UNITED STATES FISH COMMISSION AND UNITED STATES COAST SURVEY.**

PYCNOGONIDA.

Colossendeis colossea Wilson.

4982. Lat. 39° 59′ 45″ N.; long. 68° 54′ W.; 787 fathoms. United States Fish Commission.

---

* Exhibited by the United States National Museum. As indicated in the list, many of the more interesting species were obtained by Gloucester fishing schooners, which have aided the Fish Commission greatly, since 1878, in making known the fauna of the Fishing Banks of Eastern North America.

CRUSTACEA.

Amathia Agassizii Smith.

4986. Lat. 39° 57′ N.; long. 70° 37′ W.; 192 fathoms. United States Fish Commission.

Collodes robustus Smith.

4832. Lat. 37° 26′ N.; long. 74° 19′ W.; 56 fathoms. United States Fish Commission.

Euprognatha rastellifera Stimpson.

3350. Lat. 40° 07′ 48″ N.; long. 70° 43′ 54″ W.; 67 fathoms. United States Fish Commission.

Lambrus Verrillii Smith.

4559. Lat. 39° 54′ N.; long. 69° 51′ 30″ W.; 134 fathoms. United States Fish Commission.

Geryon quinquedens Smith.

4941. Lat. 39° 34′ N.; long. 71° 56′ W.; 374 fathoms. United States Fish Commission.

Bathynectes longispina Stimp.

4987. Lat. 39° 54′ N.; long. 69° 51′ 30″ W.; 134 fathoms. United States Fish Commission.

Homola barbata White.

4988. Lat. 38° 33′ N.; long. 73° 18′ W.; 104 fathoms. United States Fish Commission.

Lithodes maia Leach.

3793. Lat. 43° 15′ N.; long. 60° 20′ W. Daniel McKennon.

Eupagurus politus Smith.

4989. Lat. 39° 54′ N.; long. 69° 44′ W.; 158 fathoms. United States Fish Commission.

Catapagurus Sharreri A. M-Edw.

3369. Lat. 39° 55′ N.; long. 70° 47′ W.; 229 fathoms. United States Fish Commission.

4985. Lat. 40° N.; long. 69° 19′ W.; 93 fathoms. United States Fish Commission.

Parapagurus pilosimanus Smith.

4619. Lat. 39° 53′ 30″ N.; long. 71° 13′ 30″ W.; 319 fathoms. United States Fish Commission.

Munida, sp.

3354. Lat. 38° 39′ N.; long. 73° 11′ W.; 130 fathoms. United States Fish Commission.

Pentacheles sculptus Smith.

4934. Lat. 33° 24′ 15″ N.; long. 76° 00′ 50″ W.; 464 fathoms. United States Coast Survey steamer Blake; A. Agassiz.

Ceraphilus Agassizii Smith.

4925. Lat. 35° 45′ 30″ N.; long. 74° 48′ W.; 263 fathoms. Steamer Blake.

Pontophilus brevirostris Smith.

3355. Lat. 40° 07′ 48″ N.; long. 70° 43′ 54″ W.; 67 fathoms. United States Fish Commission.

Sabinea princeps Smith.

4552. Lat. 39° 49′ 25″ N.; long. 69° 49′ W.; 616 fathoms. United States Fish Commission.

Pandalus borealis Kröyer.

4550. Lat. 43° 06′ N.; long. 65° 04′ 30″ W.; 90 fathoms. United States Fish Commission.

Pandalus leptocerus Smith.

4728. Lat. 40° 05′ N.; long. 68° 48′ W.; 194 fathoms. United States Fish Commission.

Pandalus Montagui Leach.

3946. Off Cape Cod, Massachusetts; 70 fathoms. United States Fish Commission.

Pandalus propinquus G. O. Sars.

4890. Lat. 38° 35′ N.; long. 73° 13′ W.; 312 fathoms. United States Fish Commission.

Eumiersia ensifera Smith.

4940. Lat. 41° 24′ 45″ N.; long. 65° 35′ 30″ W.; 1,242 fathoms. Steamer Blake.

Penæus constrictus Stimp.

4822. Lat. 37° 10′ N.; long 75° 08′ W.; 18 fathoms. United States Fish Commission.

Sergestes arcticus Kröyer.

4840. Lat. 38° 29′ N.; long. 73° 21′ W.; 435 fathoms. United States Fish Commission.

Syscenus infelix Harger.

4747. Lat. 39° 53′ N.; long. 69° 47′ W.; 317 fathoms. United States Fish Commission.

ANNELIDA.

Hyalinœcia artifex Verrill.

210. Off Martha's Vineyard, Massachusetts; 200 fathoms. United States Fish Commission.

Lætmatonice armata Verrill.

224. Lat. 39° 48′ 30″ N.; long. 70° 54′ W.; 252 fathoms. United States Fish Commission.

MOLLUSCA.

Lestoteuthis Fabricii Verrill.

34225. Lat. 39° 52′ 30″ N.; long. 70° 17′ 30″ W.; 724 fathoms. United States Fish Commission.

Stoloteuthis leucoptera Verrill.

34221. Lat. 39° 43′ N.; long. 71° 32′ W.; 302 fathoms. United States Fish Commission.

Rossia Hyatti Verrill.

34222. Off Cape Cod, Massachusetts; 55 fathoms. United States Fish Commission.

Rossia sublevis Verrill.

34220. Lat. 40° 04′ N.; long. 68° 49′ W.; 234 fathoms. United States Fish Commission.

Argonauta argo Linné.

34224. Lat. 39° 34′ N.; long. 71° 56′ W.; surface. United States Fish Commission.

Alloposus mollis Verrill.

34218. Off Martha's Vineyard, Massachusetts; 300 fathoms. United States Fish Commission.

Octopus Bairdii Verrill.

34219. Lat. 40° 02′ N.; long. 70° 37′ 30″ W.; 101 fathoms. United States Fish Commission.

Octopus lentus Verrill.

34228. Le Have Bank. Gloucester fishing vessel.

Koonsia obesa Verrill.

34217. Lat. 39° 57′ N.; long. 70° 37′ W.; 192 fathoms. United States Fish Commission.

Salpa, sp (large species).

150. Lat. 40° N.; long. 69° 19′ W.; surface. United States Fish Commission.

ECHINODERMATA.

Lophothuria Fabricii Verrill.

5710. Off Cape Ann, Massachusetts; 25 fathoms. Schooner Young Sultan.

Pentacta frondosa Jæger.

5492. Off Cape Cod, Massachusetts; 35 fathoms. United States Fish Commission.

Schizaster fragilis L. Agassiz.

5719. Lat. 39° 55′ 28″ N.; long. 69° 47′ W.; 321 fathoms. United States Fish Commission.

Schizaster canaliferus L. Agassiz.

5563. Lat. 40° 02′ N.; long. 70° 37′ 30″ W.; 101 fathoms. United States Fish Commission.

Spatangus purpureus Leske.

5564. Lat. 39° 53′ N.; long. 69° 43′ W; 156 fathoms. United States Fish Commission.

Echinus gracilis A. Agassiz.

5732. Off Martha's Vineyard, Massachusetts; 100 fathoms. United States Fish Commission.

Goniocidaris papillata A. Agassiz.

5080. Lat. 38° 39′ N.; long. 73° 11′ W.; 130 fathoms. United States Fish Commission.

Asterias stellionura Perrier.

5011. Grand Banks; 200 fathoms. Schooner Howard.

Asterias Tanneri Verrill.

4118. Lat. 38° 39′ N.; long. 73° 11′ W.; 130 fathoms. United States Fish Commission.

Solaster endeca Forbes.

5734. Off Cape Cod, Massachusetts; 44 fathoms. United States Fish Commission.

Crossaster papposus Müll. & Tr.

4786. George's Bank. John Harrington.

Hippasteria phrygiana Agassiz.

5827. Off Cape Cod, Massachusetts; 44 fathoms. United States Fish Commission.

Diplopteraster multipes Verrill.

5694. Lat. 40° 05′ N.; long. 68° 48′ W; 194 fathoms United States Fish Commission.

Porania grandis Verrill.

5534. Lat. 39° 54′ N.; long. 69° 44′ W.; 158 fathoms. United States Fish Commission.

5733. Lat. 40° 04′ N.; long. 68° 49′ W.; 234 fathoms. United States Fish Commission.

Porania spinulosa Verrill.

5718. Off Cape Cod, Massachusetts; 90 fathoms. United States Fish Commission.

Odontaster hispidus Verrill.

5550. Lat. 40° 02′ N.; long. 70° 45′ W.; 89 fathoms. United States Fish Commission.

Archaster americanus Verrill.

5008. Off Newport, R. I.; 150 fathoms. United States Fish Commission.

Archaster Agassizii Verrill.

4701. Off Martha's Vineyard; 150 fathoms. United States Fish Commission.

Archaster Floræ Verrill.

4145. Lat. 39° 58′ N.; long. 70° 06′ W.; 146 fathoms. United States Fish Commission.

Luidia elegans Perrier.

5088. Lat. 39° 58′ N.; long. 70° 06′ W.; 146 fathoms. United States Fish Commission.

Tremaster mirabilis Verrill.

5707. Banquereau; 250 fathoms. Schooner Herbert M. Rogers.

Ophioscolex glacialis Müll. & Tr.

5585. Lat. 39° 57′ N.; long. 70° 37′ W.; 192 fathoms. United States Fish Commission.

Ophioglypha Sarsii Lyman.

5826. Off Marthas Vineyard; 100 fathoms. United States Fish Commission.

Astrochele Lymani Verrill.

5579. Lat. 40° 01′ N.; long. 68° 54′ W.; 640 fathoms. United States Fish Commission.

Astrophyton Agassizii Stimp.

5829. Off Cape Cod, Massachusetts; 25 fathoms. United States Fish Commission.

Astrophyton Lamarckii Müll. & Tr.

5706. Lat. 40° N.; long. 55° 50′ W. Schooner Alice M. Williams.

Astrophyton eucnemis Müll. & Tr.

5695. Grand Banks; 200 fathoms. Schooner Howard.

ANTHOZOA.

Pennatula aculeata Dan.

4141. Lat. 44° 17′ N.; long. 58° 10′ W.; 120 fathoms. Schooner Grace L. Fears.

5608. Lat. 39° 58′ N.; long. 69° 42′ W; 202 fathoms. United States Fish Commission.

Pennatula borealis Sars.

5725. Grand Banks; 150 fathoms. Schooner Plymouth Rock.

5726. Lat. 43° 25′ N.; long. 60° W; 250 fathoms. Schooner Plymouth Rock.

5727. Banquereau; 150 fathoms. Schooner Alice M. Williams.

Balticina Finmarchica Gray.

5728. Anticosti Island. Schooner Procter Brothers.

5729. Fishing banks. Schooner Wachusett.

5730. St. Peter's Bank; 175 fathoms. Schooner David A. Story.

5731. Banquereau; 175 fathoms. Schooner Alice M. Williams.

Anthoptilum grandiflorum Verrill.

5721, 5722. Lat. 45° 25′ N.; long. 57° 10′ W.; 170 fathoms. Schooner Howard.

5724. St. Peter's Bank. Gloucester fishing vessel.

Acanella Normani Verrill.

5696. Off Martha's Vineyard; 150 fathoms. United States Fish Commission.

Ceratoisis ornata Verrill.

4229. Banquereau; 300 fathoms. Schooner N. H. Phillips.

Primnoa reseda Verrill.

4601. Near George's Bank. Schooner Alice G. Wonson.

5828. Lat. 42° 06′ N.; long. 63° 15′ W.; 200 fathoms. Schooner Alice G. Wonson.

Acanthogorgia armata Verrill.

5697. Edge of Grand Banks. Lat. 44° 32′ N.; 170–300 fathoms. Schooner Guy Cunningham.

Paragorgia arborea Edw. & H.

4089. East of Sable Island; 280 fathoms. Schooner Magic.

4568. Lat. 43° 25′ N.; long. 60° W.; 250 fathoms. Schooner Plymouth Rock.

Anthomastus grandiflorus Verrill.

5708. Lat. 44° 02′ N.; long. 59° W.; 325 fathoms. Schooner Marion.

5709. Grand Banks; 175 fathoms. Schooner Marion.

Anthothela grandiflora Verrill.

5705. Lat. 44° 13′ N.; long. 58° 02′ W.; 175 fathoms. Schooner Bellerophon.

Actinernus nobilis Verrill.

5701. Lat. 44° 03′ N.; long. 58° 26′ W.; 250 fathoms. Schooner Procter Brothers.

5702. Lat. 43° 14′ N.; long. 61° 07′ W.; 250 fathoms. Schooner Alice G. Wonson.

5703. Lat. 43° 30′ N.; long. 60° 25′ W.; 50 fathoms. Schooner G. P. Whitman.

5704. Lat. 43° 42′ N.; long. 59° 10′ W. Gloucester fishing vessel.

Urticina nodosa Verrill.

5712. Lat. 49° 09′ N.; long. 52° 03′ W.; 180 fathoms. Schooner Alice M. Williams.

5713. (Var. *tuberculosa*.) Western Bank. Schooner Mystic.

5714. (Var. *tuberculosa*.) Off Cape Negro, Nova Scotia. Schooner Martha C.

5715. Lat. 43° 53′ N.; long. 59° 04′ W.; 150 fathoms. Gloucester fishing vessel.

5716. Grand Banks. Schooner Admiral.

5717. Lat. 44° 17′ N.; long. 58° 10′ W.; 120 fathoms. Schooner Grace L. Fears.

5823. (Var. *A*.) Lat. 43° 19′ N.; long. 60° 36′ W.; 250 fathoms. Schooner Wachusett.

5824. (Var. *A*.) Grand Banks. Schooner Plymouth Rock.

5825. (Var. *B*.) Western Bank; 300 fathoms. Schooner Nathaniel Webster.

Urticina multicornis Verrill.

5503. Off Cape Cod, Massachusetts; 44 fathoms. United States Fish Commission.

Urticina callosa Verrill.

5430. Lat. 39° 54′ N.; long. 70° 37′ W.; 225 fathoms. United States Fish Commission.

Boloeera Tuediæ Gosse.

5445. Lat. 39° 54′ N.; long. 70° 37′ W.; 225 fathoms. United States Fish Commission.

Cerianthus borealis Verrill.

5493. Lat. 40° 01′ N.; long. 71° 02′ W.; 125 fathoms. Schooner Josie Reeves.

Epizoanthus paguriphilus Verrill.

4619. Lat. 39° 53′ 30″ N.; long. 71° 13′ 30″ W.; 319 fathoms. United States Fish Commission.

Flabellum Goodei Verrill.

5700. Lat. 44° 46′ N.; long. 56° 10′ W; 265 fathoms. Schooner Augusta H. Johnson.

PORIFERA.

Cladorhiza grandis Verrill.

995. George's Bank; 150 fathoms. Schooner Alice G. Wonson.

996. Fishing Banks. Schooner Conductor.

Dorvillia echinata Verrill.

997. Lat. 43° 17′ N.; long. 51° 25′ W.; 175 fathoms. Schooner Plymouth Rock.

*COLLECTION OF FRESH-WATER CRAYFISHES (Astacidæ) FROM THE UNITED STATES, CONTAINING NEARLY ALL THE DESCRIBED SPECIES.**

Cambarus acutus Girard.

3382. Wheatland, Knox County, Indiana. R. Ridgway.

Cambarus Clarkii Girard.

3359. Mississippi River, near New Orleans. G. Dunbar's Sons.

Cambarus troglodytes Hagen.

4053. Oakley, South Carolina. F. W. Haywood.

Cambarus Blandingii Erich.

3381. Columbia, South Carolina. M. McDonald.

Cambarus fallax Hagen. (?)

4969. Saint John's River, Florida. Museum of Comparative Zoology, Cambridge, Massachusetts.

Cambarus Le Contei Hagen.

4958. Mobile, Alabama. Museum Comparative Zoology. (Type.)

Cambarus spiculifer Hagen.

4962. Athens, Georgia. Museum Comparative Zoology.

---

* Exhibited by the United States National Museum. This collection has been named by Prof. Walter Faxon, of the Museum of Comparative Zoology, Cambridge, Massachusetts.

Cambarus versutus Hagen.

4963. Spring Hill, Alabama. Museum Comparative Zoology. (Type.)

Cambarus pellucidus Erich.

4970. Mammoth Cave, Kentucky. Museum Comparative Zoology.

Cambarus affinis Erich.

4904. Havre de Grace, Maryland. T. H. Bean.

4893. Potomac River, Gunston, Virginia. M. McDonald.

Cambarus virilis Hagen.

4900. Milwaukee, Wisconsin. E. G. Blackford.

Cambarus placidus Hagen.

4966. Lebanon, Tennessee. Museum Comparative Zoolcgy. (Type.)

Cambarus juvenilis Hagen.

4967. Kentucky River, Little Hickman, Kentucky. Museum Comparative Zoology. Form 1. (Type.)

Cambarus propinquus Girard.

4851. Illinois. G. W. Milner.

Cambarus obscurus Hagen.

4971. Genesee River, Rochester, New York. Museum Comparative Zoology. (Type.)

Cambarus rusticus Girard.

4968. Cincinnati, Ohio. Museum Comparative Zoology. (Type.)

Cambarus immunis Hagen.

4866. Milwaukee, Wisconsin. E. G. Blackford. (♂, Form II.)

Cambarus extraneus Hagen.

4957. Tennessee River, near Bridge of Georgia. Museum Comparative Zoology. (Type.)

Cambarus Bartoni Erich.

3835. Carlisle, Pennsylvania. S. F. Baird.

Cambarus robustus Girard.

4961. Forestville, New York. Museum Comparative Zoology. (Type.)

Cambarus obesus Hagen.

2163. Locality unknown. 4973. Decatur, Illinois. Museum Comparative Zoology. (Form I.)

Cambarus latimanus.

3374. South Carolina (?) M. McDonald.

Cambarus advena Hagen.

4964. Georgia. Museum Comparative Zoology.

Cambarus Carolinus Erich.

4972. Mobile, Alabama. Museum Comparative Zoology. (Type of Hagen.)

Cambarus gracilis Bundy.

4960. Decatur, Illinois. Museum Comparative Zoology.

Cambarus Sloanii Bundy.

4965. New Albany, Indiana. Museum Comparative Zoology. (Form I and II.)

Cambarus spinosus Bundy.

4881. Cypress Creek, Lauderdale County, Alabama. Herrick.

Astacus Gambelii.

4855. Santa Barbara, California. Dr. Webb.

Astacus nigrescens Stimpson.

4974. San Francisco, California. Museum Comparative Zoology.

Astacus Trowbridgii Stimpson.

2080. Astoria, Columbia River, Oregon. Trowbridge. (Types.)

Astacus Klamathensis Stimpson.

3899. Walla Walla, Washington Territory. Captain Bendire, United States Army.

Astacus leniusculus Dana.

2161. Oregon (?)

COLLECTION OF AMERICAN FRESH WATER SPONGES.

Prepared by Mr. Edward Potts, of Philadelphia, and presented by him to the United States National Museum.

MICROSCOPIC PREPARATIONS.

Spongilla paupercula Bowerbank.

1. Lake Cochituate, Boston, Massachusetts. Opaque.
2. Lake Cochituate, Boston, Massachusetts. Transparent.
3. Lake Cochituate, Boston, Massachusetts. Spicules.

Spongilla aspinosa Potts.

4. Absecum, New Jersey. Opaque.
5. Absecum, New Jersey. Transparent.
6. Absecum, New Jersey. Spicules.

Spongilla lacustris Johnston.

7. European form, received from H. J. Carter.
8. (?) Ridley Creek, Media, Pennsylvania. Opaque.
9. (?) Ridley Creek, Media, Pennsylvania. Transparent.
10. (?) Ridley Creek, Media, Pennsylvania. Spicules.
11. Chester County, Pennsylvania. Transparent.
12. (?) White Haven, Pennsylvania. Transparent.
13. Var. *mutica* Potts, Lansdowne, Pennsylvania. Opaque.
14. Var. *mutica* Potts, Lansdowne, Pennsylvania. Transparent.
15. Var. *mutica* Potts, Lansdowne, Pennsylvania. Spicules.
16. Var. *Dawsoni* Bk.
19. Var. *multiforis* Carter.

Spongilla montana Potts.

17. Catskill Mountains, New York. Transparent.
18. Catskill Mountains, New York. Spicules.

Spongilla fragilis Leidy.

20. Type, from a specimen in the collection of the Academy of Natural Sciences of Philadelphia.
21. Schuylkill River, Philadelphia, Pennsylvania. Opaque.
22. Schuylkill River, Philadelphia, Pennsylvania. Transparent.
23. Schuylkill River, Philadelphia, Pennsylvania. Spicules.
24. Ridley Creek, Media, Pennsylvania. Transparent.
25. Var. *Ottawaensis* Dawson. Buffalo, New York.
26. Var. *minuta* Potts. Lehigh Gap. Pennsylvania.
27. Var. *minutissima* Potts. Lake Hopatcong, New Jersey. Opaque.
28. Var. *minutissima* Potts. Lake Hopatcong, New Jersey. Transparent.
29. Var. *minutissima* Potts. Lake Hepatcong, New Jersey. Spicules.
30. Var. *irregularis* Potts. Lake Hepatcong, New Jersey.
31. Var. *Lordii* Bk. From Bowerbank's type specimens.

Meyenia Leidii Bk.

32. Phillipsburg, New Jersey. Opaque.
33. Schuylkill River, Pennsylvania. Opaque.
34. Schuylkill River, Pennsylvania. Transparent.
35. Schuylkill River, Pennsylvania. Spicules.

Meyenia fluviatilis Johnston.

36. European form, received from H. J. Carter.
37. (?) Chester Creek, Pennsylvania. Opaque.
38. (?) Chester Creek, Pennsylvania. Transparent.
39. (?) Chester Creek, Pennsylvania. Spicules.
40. Var. *astrosperma* Potts. Lehigh Gap, Pennsylvania. Opaque.
41. Var. *astrosperma* Potts. Lehigh Gap, Pennsylvania. Transparent.
42. Var. *astrosperma* Potts. Lehigh Gap, Pennsylvania. Spicules.
43. Var. *acuminata* Potts. Lake Cochituate, Boston, Massachusetts. Opaque.
44. Var. *acuminata* Potts. Lake Cochituate, Boston, Massachusetts. Transparent.
45. Var. *acuminata* Potts. Lake Cochituate, Boston, Massachusetts. Spicules.

Meyenia robusta Potts.

46. Honey Lake Valley, California.

Meyenia crateriforma Potts.

47. Brandywine County, Pennsylvania. Opaque.
48. Brandywine County, Pennsylvania. Transparent.
49. Brandywine County, Pennsylvania. Spicules.

Meyenia Everetti Mills.

50. Berkshire County, Massachusetts. Opaque.
51. Berkshire County, Massachusetts. Transparent.
52. Berkshire County, Massachusetts. Spicules.

Heteromeyenia repens Potts.

57. Lehigh Gap, Pennsylvania. Opaque.
58. Lehigh Gap, Pennsylvania. Transparent.
59. Lehigh Gap, Pennsylvania. Spicules.

Heteromeyenia argyrosperma Potts.

60. Lehigh Gap, Pennsylvania. Opaque.
61. Lehigh Gap, Pennsylvania. Transparent.
62. Lehigh Gap, Pennsylvania. Spicules.
63. Var. *tenuis* Potts. Lake Hepatcong, New Jersey. Opaque.
64. Var. *tenuis* Potts. Lake Hepatcong, New Jersey. Transparent.
65. Var. *tenuis* Potts. Lake Hepatcong, New Jersey. Spicules.

Heteromeyenia Baleni Potts.

66. Plainfield, New Jersey. Opaque.
67. Plainfield, New Jersey. Transparent.
68. Plainfield, New Jersey. Spicules.

Heteromeyenia Ryderi Potts.

69. Indian River, Philadelphia, Pennsylvania. Opaque.
70. Indian River, Philadelphia, Pennsylvania. Transparent.
71. Indian River, Philadelphia, Pennsylvania. Spicules.
72. White Haven, Pennsylvania.
73. White Haven, Pennsylvania.

Carterius tubisperma Mills.

85. Niagara River, New York. Opaque.
86. Niagara River, New York. Transparent.
87. Niagara River, New York. Spicules.

Carterius tenosperma Potts.

88. Lansdowne, Pennsylvania. Opaque.
89. Lansdowne, Pennsylvania. Transparent.
90. Lansdowne, Pennsylvania. Spicules.

Carterius latitenta Potts.

91. Chester Creek, Pennsylvania. Opaque.
92. Chester Creek, Pennsylvania. Transparent.
93. Chester Creek, Pennsylvania. Spicules.

Tubella reticulata Bk.

94. Rio Amazonas, Brazil. Transparent.
95. Rio Amazonas, Brazil. Spicules.

Tubella Pennsylvanica Potts.

96. Lake Hepatcong, New Jersey. Opaque.
97. White Haven, Pennsylvania. Transparent.
98. Lehigh Gap, Pennsylvania. Spicules.

Tubella Fanshawei Potts.

99. Bristol, Pennsylvania.

Parmula Batesii Bk.

100. Rio Amazonas, Brazil. Opaque.
101. Rio Amazonas, Brazil. Transparent.
102. Rio Amazonas, Brazil. Spicules.

Parmula Brownii, Bk

103. British Guiana, South America. Transparent.

Uruguaya corallioides Bk.

104. Uruguay River, South America. Spicules.

DRIED PREPARATIONS, CONTAINED IN BOTTLES.

Spongilla aspinosa Potts.

998. Absecum, New Jersey.

Spongilla lacustris Johnston.

999. Chester Creek, Pennsylvania.
1000. Fairmount, Philadelphia, Pennsylvania.

Spongilla fragilis Leidy.

1001. Schuylkill River, Philadelphia, Pennsylvania.
1002. Ridley Creek, Pennsylvania.
1003. Fairmount Locks, Philadelphia, Pennsylvania.
1004. Niagara River, New York.
1005. Brandywine Creek, Philadelphia, Pennsylvania.

Meyenia Leidii Bk.

1006. Fairmount, Philadelphia, Pennsylvania.

Meyenia fluviatilis Johnston.

1007. Var. *astrosperma* Potts. Lehigh Gap, Pennsylvania.
1008. Var. *asperrima* Dawson. Buffalo, New York.

Heteromeyenia repens Potts.

1009. Lake Hepatcong, New Jersey.

Carterius tubisperma Mills.

1010. Niagara River, New York.

Carterius latitenta Potts.

1011. Chester Creek, Pennsylvania.

Tubella Pennsylvanica Potts.

1012. Lake Hepatcong, New Jersey.
1013. White Haven, Pennsylvania.

COLLECTION OF MOUNTED MARINE ALGÆ FROM THE ATLANTIC AND PACIFIC COASTS OF THE UNITED STATES, PREPARED BY PROF. WILLIAM G. FARLOW, OF HARVARD COLLEGE, CAMBRIDGE, MASSACHUSETTS.

This collection, exhibited by the United States National Museum, comprises specimens collected by Mr. F. W. Hooper and Dr. Palmer, at Key West; by Dr. Farlow, on the New England coast; by Prof. D. C. Eaton, from various sources; by A. R. Young, at New York; Mrs. A. S. Davis, at Cape Ann; Mrs. Beebe, at Gloucester, Massachusetts; Mrs. B. D. Halstead, at Swampscott; Mr. H. Averill, at New York; Dr. L. R. Gibbes, in South Carolina; Miss M. A. Booth, at Orient, Long Island; and from California and Oregon by Dr. C. L. Anderson, Capt. I. Stratton, Rev. E. Hall, Mr. H. Hemphill, Mr. D. Cleveland, and Mr. W. H. Dall.

Amansia multifida, Lmx. Key West.

Dasya Gibbesii, Harv. Key West.

Dasya elegans, Ag. Chenille. Cape Cod.
Dasya ramosissima, Harv. Key West.
Dasya Harveyi, Ashmead. Key West.
Dasya mollis, Harv. Key West.
Dasya mucronata, Harv. Key West.
Dasya Wurdemanni, Bailey. Key West.
Dasya callithamnion, Harv. San Diego.
Dasya Tumanowiczi, Gatty. Key West.
Dasya lophoclados, Mont. Key West.
Dasya plumosa, Bail. and Harv. Santa Cruz, California.
Bostrychia Montagnei, Harv. Key West.
Bostrychia calamistrata, Mont. Key West.
Bostrychia Moritziana, Mont. Florida.
Polysiphonia urceolata, Grev. Nahant, Massachusetts. Var. *formosa*, New England.
Polysiphonia Havanensis, Mont. Var. *Binneyi*, Ag. Key West.
Polysiphonia ferulacea, Ag. Key West.
Polysiphonia Olneyi, Harv. Dough-balls. Long Island Sound.
Polysiphonia Harveyi, Bail. Nigger-hair. Wood's Holl, Massachusetts.
Polysiphonia elongata, Grev. Lobster-claws. Gay Head, Massachusetts.
Polysiphonia violacea, Grev. Wood's Holl, Massachusetts.
Polysiphonia fibrillosa, Grev. Wood's Holl, Massachusetts.
Polysiphonia variegata, Ag. Wood's Holl, Massachusetts.
Polysiphonia pennata, Ag. California.
Polysiphonia parasitica, Grev. California. Var. *dendroidea*, Ag. California.
Polysiphonia Baileyi, Ag. Pacific coast.
Polysiphonia pecten-veneris, Harv. Florida.
Polysiphonia atrorubescens, Grev. Wood's Holl, Massachusetts.
Polysiphonia bipinnata, Post. and Rupr. West coast.
Polysiphonia Woodii, Harv. West coast.
Polysiphonia nigrescens, Grev.
Polysiphonia fastigiata, Grev. Nahant, Massachusetts.
Odonthalia aleutica, Ag. Oregon.
Odonthalia Lyallii, Harv. Neeah Bay, Washington Territory.
Rhodomela larix, Ag. California.
Rhodomela floccosa, Ag. Aleutian Islands.
Rhodomela subfusca, Ag. Gloucester, Massachusetts. Var. *gracilis*, same limits. Var. *Rochei*, Long Island Sound.
Digenia simplex, Ag. Key West.
Bryothamnion triangulare, Ag. Key West.
Bryothamnion Seaforthii, Ag. Florida.
Alsidium Blodgettii, Harv. Key West, Florida.
Acanthophora Thierii, Lmx. Florida to Brazil; Pacific Ocean.
Acanthophora muscoides, Ag. Florida.
Chondria dasyphylla, Ag. Cape Cod.

Chondria striolata, Ag. (*C. Baileyana*, Mont.) Cape Cod.
Chondria tenuissima, Ag. Wood's Holl, Massachusetts.
Chondria littoralis, Harv. Wood's Holl, Massachusetts.
Chondria atropurpurea, Harv. Key West, Florida.
Laurencia pinnatifida, Lmx. Pepper dulse. California.
Laurencia virgata, Ag. California.
Laurencia obtusa, Lmx. Florida.
Laurencia implicata, Ag. Key West.
Laurencia cervicornis, Harv. Key West; San Diego, California.
Laurencia gemmifera, Harv. Florida.
Laurencia papillosa, Grev. Florida.
Laurencia paniculata, Ag. San Diego, California.
Chylocladia ovalis, Hook. (*Lomentaria*, Endl.) California.
Grinnellia Americana, Harv. Wood's Holl, Massachusetts.
Delesseria sinuosa, Lmx. Gloucester, Massachusetts.
Delesseria quercifolia, Bory. California.
Delesseria alata, Lmx. Gloucester, Massachusetts.
Delesseria hypoglossum, Lmx. Charleston, South Carolina.
Delesseria tenuifolia, Harv. Key West.
Delesseria involvens, Harv. Key West.
Delesseria Leprieurii, Mont. New York.
Delesseria decipiens, Ag. West coast. Neeah Bay, Washington Territory.
Nitophyllum punctatum, var. *ocellatum*, Grev. Key West.
Nitophyllum spectabile, Eaton, MSS. California.
Nitophyllum laceratum, Grev. California.
Nitophyllum latissimum, Ag. California.
Nitophyllum areolatum, Eaton, MSS. California.
Nitophyllum (*Neuroglossum*) *Andersonii*, Ag. California.
Nitophyllum Ruprechtianum, Ag. West coast.
Calliblepharis ciliata, Kütz. Cape Ann, Massachusetts.
Gracilaria multipartita, Ag., var. *angustissima*, Harv. New York.
Gracilaria cervicornis, Ag. Key West.
Gracilaria confervoides, Grev. Florida; California.
Gracilaria armata, Ag. Key West.
Corallina officinalis, L. Cape Ann.
Corallina squamata, Ellis and Sol. San Diego, California.
Jania rubens, Lmx. San Diego, California.
Jania capillacea, Harv. Key West.
Amphiroa fragillissima, Lmx. Florida.
Amphiroa nodulosa, Kütz. Florida.
Amphiroa debilis, Kütz. Florida.
Amphiroa Californica, Decaisne. West coast.
Melobesia farinosa, Lmx. East coast.
Melobesia pustulata, Lmx. Wood's Holl, Massachusetts.
Lithothamnion polymorphum, Aresch. Eastport, Maine.

Hildenbrandtia rosea, Kütz. Eastport, Maine.
Gelidium corneum, Lmx. Florida; New Haven, Connecticut.
Gelidium cartilagineum, Grev. San Diego, California.
Gelidium Coulteri, Harv. California.
Wurdemannia setacea, Harv. Key West.
Eucheuma isiforme, Ag. Key West.
Eucheuma ? acanthocladum, Ag. (*Chrysymenia*, Harv). Key West.
Hypnea musciformis, Lmx. Wood's Holl, Massachusetts.
Hypnea cornuta, Ag. Key West.
Rhodymenia palmata, Grev. Common dulse. Swampscott, Massachusetts.
Rhodymenia palmetta, Grev. California.
Rhodymenia corallina, Grev. California.
Euthora cristata, Ag. Gloucester, Massachusetts.
Plocamium coccineum, Lyngb, var. *flexuosum*. West coast.
Stenogramma interrupta, Mont. California.
Pikea Californica, Harv. California.
Champia parvula, Harv. Noank, Connecticut.
Lomentaria Baileyana, Farlow (*Chylocladia*, Harv). New York Bay.
Lomentaria rosea, Thuret. Gay Head, Massachusetts.
Rhabdonia tenera, Ag. (*Solieria chordalis*, Harv). Wood's Holl, Massachusetts.
Rhabdonia Coulteri, Harv. California.
Cordylocladia conferta, Ag. San Diego, California.
Polyides rotundus, Ag. Cape Ann, Massachusetts.
Peyssonnelia atro-purpurea, Crouan ? Key West.
Nemalion multifidum, Ag. Watch Hill, Rhode Island.
Scinaia furcellata, Bivon. Gay Head, Massachusetts.
Liagora valida, Harv. Florida.
Liagora pinnata, Harv. Florida.
Liagora pulverulenta, Ag. Key West.
Wrangelia penicillata, Ag. Key West.
Phyllophora Brodiæi, Ag. Long Island Sound.
Phyllophora membranifolia, Ag. Long Island Sound.
Gymnogongrus Norvegicus, Ag. (including *G. Torreyi*, Ag.). Peak's Island, Maine.
Gymnogongrus tenuis, Ag. California.
Gymnogongrus Griffithsiæ, Ag. California.
Gymnogongrus linearis, Ag. California.
Ahnfeltia gigartinoides, Ag. West coast.
Ahnfeltia plicata, Fr. Cape Ann, Massachusetts.
Cystoclonium purpurascens, Kütz. Block Island, Rhode Island.
Callophyllis variegata, Ag. California.
Callophyllis obtusifolia, Ag. San Diego, California.
Callophyllis discigera, Ag. California.
Gigartina acicularis, Lmx. Florida.

Gigartina canaliculata, Harv. West coast.
Gigartina mamillosa, Ag. Portland, Maine; Santa Cruz, California.
Gigartina microphylla, Harv., and var. *horrida*. California.
Gigartina radula, Ag. West coast.
Chondrus crispus, Lyngb. Irish moss. Cape Ann, Massachusetts. Very common.
Chondrus affinis, Harv. California.
Iridæa laminarioides, Bory. (including *Iridæa minor* and *Iridæa dichotoma*). West coast.
Endocladia muricata, Ag. West coast.
Cryptonemia crenulata, Ag. Key West.
Chrysymenia halymenioides, Harv. Key West.
Chrysymenia uvaria, Ag. Key West.
Halymenia ligulata, Ag., var. *Californica;* Santa Cruz, California.
Halymenia Floresia, Ag. Key West.
Prionitis lanceolata, Harv. West coast.
Prionitis Andersonii, Eaton, MSS. Santa Cruz, California.
Schizymenia edulis, Ag. Oregon.
Schizymenia? coccinea, Harv. Santa Cruz, California.
Grateloupia Gibbesii, Harv. Charleston, South Carolina.
Grateloupia Cutleriæ, Kütz. California.
Grateloupia filicina, Ag. Florida.
Halosaccion hydrophora, Ag. West coast.
Halosaccion fucicola, Post. and Rupr. West coast.
Halosaccion ramentaceum, Ag. Eastport, Maine.
Spyridia aculeata, Kütz. Florida.
Spyridia filamentosa, Harv. Wood's Holl, Massachusetts.
Microcladia Coulteri, Harv. West coast.
Microcladia Californica, Farlow. California.
Microcladia borealis, Rupr. West coast.
Centroceras clavulatum, Ag. Key West.
Centroceras Eatonianum, Farlow. West coast.
Ceramium nitens, Ag. Key West.
Ceramium rubrum, Ag. East coast.
Ceramium Deslongchampsii, Ch. Eastport, Maine.
Ceramium diaphanum, Roth. California.
Ceramium strictum, Harv. New England.
Ceramium Youngii, Farlow, MSS. Canarsie, Long Island.
Ceramium tenuissimum, Lyngb. Key West.
Ceramium fastigiatum, Harv. Southern New England.
Ceramium ———. Key West.
Ptilota densa, Ag. California.
Ptilota hypnoides, Harv. California.
Ptilota plumosa, Ag., var. *filicina*, West coast. Var. *serrata*. Eastport, Maine, and Neeah Bay, Washington Territory.
Ptilota elegans, Bonnem. New York.

Gloiosiphonia capillaris, Carm. Cape Ann, Massachusetts.
Crouania attenuata, J. Ag. Key West.
Griffithsia Bornettiana, Farl. Wood's Holl, Massachusetts.
Callithamnion tetragonum, Ag. Orient, Long Island.
Callithamnion Baileyi, Harv. New York.
Callithamnion ptilophora, Eaton, MSS. California.
Callithamnion Borreri, Ag. New Haven, Connecticut.
Callithamnion byssoideum, Arn. Long Island Sound.
Callithamnion corymbosum, Ag. Beverly, Massachusetts.
Callithamnion versicolor, Ag., var. *seirospermum*, Harv. New York.
Callithamnion plumula, Lyngb. Gay Head, Massachusetts.
Callithamnion heteromorphum, Ag., MSS. California.
Callithamnion Americanum, Harv. New York.
Callithamnion Pylaisæi, Mont. Gloucester, Massachusetts.
Callithamnion floccosum, Ag., var. *pacificum*, Harv. Neeah Bay, Washington Territory.
Callithamnion cruciatum, Ag. New York.
Callithamnion Lejolisia, Farlow, MSS. San Diego, California.
Callithamnion Turneri, Ag. New York.
Callithamnion Rothii, Lyngb. New England Coast.
Callithamnion roseum, Lyng. New York.
Porphyra vulgaris, Ag. Laver. East coast.
Bangia fuscopurpurea, Lyngb. East coast.
Chantransia efflorescens, Thur. Gay Head, Massachusetts.
Chantransia virgatula, Thuret. Portland, Maine.
Erythrotrichia ceramicola, Aresch. Cape Ann, Massachusetts.
Padina pavonia, Lmx. Peacock's tail. Key West, Florida.
Zonaria lobata, Ag. Key West.
Zonaria flava, Ag. San Diego, California.
Taonia Schrœderi, Ag. Florida.
Dictyota fasciola, Lmx. Florida; Mediterranean Sea.
Dictyota dichotoma, D. C. Charleston.
Dictyota ciliata, Ag. Key West.
Dictyota Kunthii, Ag. San Diego, California.
Dictyota acutiloba, Ag. Key West.
Sargassum vulgare, Ag. Atlantic Ocean.
Sargassum bacciferum, Ag. Gulf-weed. Gulf Stream.
Sargassum dentifollium, Ag. Key West.
Sargassum Agardianum, Farlow, MSS. San Diego, California.
Turbinaria vulgaris, Ag. Key West.
Fucus fastigiatus, Ag. West coast.
Fucus distichus, L. (*F. filiformis*, Gm.). Swampscott, Massachusetts.
Fucus furcatus, Ag. Marblehead, Massachusetts.
Fucus vesiculosus, L. Rock-weed. Swampscott, Massachusetts.
Fucus serratus, L. Nova Scotia.

Nereocystis Lütkeana, Post. and Rupr. Great bladder-weed. Monterey, California, and northward.
Alaria esculenta, Grev. Badderlocks. Henware. Cape Cod.
Laminaria saccharhina, Lmx. Devil's apron; Kelp. New York, northward; West coast; Europe; Japan ?.
Laminaria longicruris, De la Pyl. Devil's apron; Kelp. New England.
Laminaria flexicaulis, Le Jolis. Devil's apron; Kelp. New England.
Agarum Turneri, Post. and Rupr. Sea-colander. Nahant, Massachusetts.
Stilophora rhizodes, Ag. Vineyard Sound.
Asperococcus sinuosus, Bory. Key West.
Asperococcus echinatus, Grev. New England coast.
Hydroclathrus cancellatus, Bory. Noank, Connecticut.
Ralfsia verrucosa, Aresch. Nahant, Massachusetts.
Chorda filum, Stack. New York.
Chordaria flagelliformis, Ag. Eastport, Maine.
Chordaria abietina, Rupr. Santa Cruz, California.
Chordaria divaricata, Ag. Gloucester, Massachusetts.
Castagnea virescens, Thuret. Wood's Holl, Massachusetts.
Leathesia tuberiformis, Gray. Watch Hill, Rhode Island.
Elachista fucicola, Fr. New England.
Myrionema strangulans, Grev. Wood's Holl, Massachusetts.
Myrionema Leclancherii, Harv. Gloucester, Massachusetts.
Cladostephus spongiosus, Ag. Newport, Rhode Island.
Cladostephus verticillatus, Ag. Gay Head, Massachusetts.
Sphacelaria fusca, Ag. On *Amphiroa Californica*. San Diego, California.
Sphacelaria radicans, Ag. New England.
Ectocarpus firmus, Ag. (*E. littoralis*, Harv.) New England.
Ectocarpus Farlowii, Thuret. Peak's Island, Maine.
Ectocarpus siliculosus, Lyngb. Charleston, South Carolina.
Ectocarpus viridis, Harv. Orient, Long Island.
Ectocarpus fasciculatus, Harv. New England coast.
Ectocarpus granulosus, Ag. Santa Cruz, California.
Ectocarpus Hooperi, Harv. Greenport, Long Island.
Desmarestia aculeata, Lmx. Eastport, Maine.
Desmarestia viridis, Lmx. New York.
Desmarestia ligulata, Lmx. Monterey, California.
Punctaria latifolia, Grev., and var. *zosteræ*, Le Jolis. Eastport, Maine.
Punctaria plantaginea, Grev. New England.
Phyllitis fascia, Ktz. Eastport, Maine.
Scytosiphon lomentarius, Ag. Eastport, Maine.
Caulerpa prolifera, Lmx. Florida.
Caulerpa crassifolia, Ag., var. *Mexicana*. Florida.
Caulerpa plumaris, Ag. Florida.
Caulerpa Ashmeadii, Harv. Key West.
Caulerpa ericifolia, Ag. Florida.

Cœulerpa cupressoides, Ag. Key West.
Caulerpa lanuginosa, Ag. Key West.
Caulerpa paspaloides, Bory. Florida.
Caulerpa clavifera, Ag. Florida.
Halimeda opuntia, Lmx. Florida.
Halimeda tuna, Lmx. Florida.
Halimeda tridens, Lmx. Key West.
Udotea flabellata, Lmx. Key West.
Udotea conglutinata, Lmx. Key West.
Codium tomentosum, Stack. Florida; var. *damœcornis*. West coast.
Chlorodesmis ? Key West.
Bryopsis plumosa, Lmx. Eastern coast.
Bryopsis hypnoides, Lmx. Key West.
Vaucheria piloboloides, Thuret. Wood's Holl, Massachusetts.
Dasycladus occidentalis, Harv. Florida.
Dasycladus clavæformis, Ag. Key West.
Acetabularia crenulata, Lmx. Florida.
Cymopolia barbata, Lmx. Key West.
Chamædoris annulata, Mont. Key West.
Penicillus dumetosus, Dne. Florida; West Indies.
Penicillus capitatus, Lmx. Mermaid's shaving-brush. Florida.
Blodgettia? confervoides, Harv. Key West.
Anadyomene flabellata, Lmx. Key West.
Dictyosphæria favulosa, Dne. Key West.
Ascothamnion intricatum, Kütz. Key West.
Enteromorpha intestinalis, Link. New England.
Enteromorpha compressa, Grev. New England.
Enteromorpha clathrata, Grev. New England coast.
Ulva latissima, Linn. Sea-lettuce. New England coast.
Ulva fasciata, Delile. California.
Cladophora membranacea, Ag. Key West.
Cladophora rupestris, L. Cape Ann, Massachusetts.
Cladophora arcta, Dillw. Cape Ann, Massachusetts.
Cladophora lanosa, Roth. Orient, Long Island.
Cladophora uncialis, Fl. Dan. New England coast.
Cladophora lætevirens, Dillw. Key West, Florida.
Cladophora fracta, Fl. Dan. Eastern coast.
Chætomorpha Picquotiana, Mont. Cape Ann, Massachusetts.
Chætomorpha melagonium, Web. and Mohr. Cape Ann, Massachusetts.
Chætomorpha sutoria, Berk. Stonington, Connecticut.
Chætomorpha brachygona, Harv. Key West.
Chætomorpha tortuosa, Dillw. Eastport, Maine.
Hormotrichum Younganum, Dillw. New England coast.
Lyngbya majuscula, Harv. Cape Cod.
Lyngbya ferruginea, Ag. New England coast.
Lyngbya Kützungiana, Thur. Eastern coast.

Calothrix confervicola, Ag. East coast.
Calothrix scopulorum, Ag. East coast.
Sphærozyga Carmichaelii, Harv. Wood's Holl, Massachusetts.
Petrocelis cruenta, Ag. Eastport, Maine.
Spirulina tenuissima, Kütz. Eastport, Maine.
Chnoöspora fastigiata, Ag. San Diego, California.
Hormactis Farlowi, Bornet. East coast.

HERBARIUM OF NORTH AMERICAN ALGÆ.

Prepared by W. G. Farlow, C. L. Anderson, and D. C. Eaton.

SPECIMENS OF ROCK FORMATION FROM DEEP WATER OFF THE NEW ENGLAND COAST.

These specimens were derived as follows: one from Station 1124, United States Fish Commision, lat. 40° 01′ N., long. 68° 54′ W., depth 340 fathoms; one from George's Bank, depth 70-200 fathoms, collected by a Gloucester fishing schooner, and presented by J. D. Lloyd, Gloucester; and one from George's Bank, depth not recorded, collected by a Gloucester fishing schooner.

Prof A. E. Verrill wrote as follows, in 1878, and again in 1882, regarding the discovery of these rock specimens:

"One of the most important results of the investigations by the United States Fish Commission, in 1878, was the discovery of a hitherto unknown geological formation, apparently of great extent, belonging probably to the Miocene or later Tertiary. The evidence consists of numerous large fragments of eroded, but hard, compact, calcareous sandstone and arenaceous limestone, usually perforated by the burrows of *Saxicava rugosa*, and containing in more or less abundance fossil shells, fragments of lignite, and in one case a spatangoid sea-urchin. Probably nearly one-half of the species are northern forms, still living on the New England coast, while many others are unknown upon our coasts, and are apparently, for the most part, extinct. From George's Bank about a dozen fossiliferous fragments have been obtained, containing more than twenty-five distinct species of shells. These fragments came from various parts of the bank, including the central part, in depths varying from 35 to 70 fathoms, or more. From Banquereau we received one specimen of similar rock, and from the Grand Banks two similar specimens. At present, it appears probable that these fragments have been detached from a very extensive submerged Tertiary formation, at least several hundreds of miles in length, extending along the outer banks, from off Newfoundland nearly to Cape Cod, and perhaps constituting, in large part, the solid foundations of these remarkable submarine elevations."

"At several localities off the southern coast of New England, during the summer of 1882, the United States Fish Commission steamer Fish-hawk dredged up at several stations, but especially in depths of 234,

351, and 640 fathoms, fragments and nodular masses, or concretions, of a peculiar calcareous rock, evidently of deep-sea origin, and doubtless formed at or near the places where it was obtained. These specimens varied in size from a few inches in diameter up to one irregular nodular mass, taken at station 1124, in 640 fathoms, which was 29 inches long, 14 broad, and 6 thick, with all parts well rounded. This probably weighed 60 pounds or more. The masses differ much in appearance, color, texture, and fineness of grain, but they are all composed of grains of siliceous sand, often very fine, cemented by more or less abundant calcareous matter. The sand consists mainly of rounded grains of quartz, with some feldspar, mica, garnet, and magnetite. It is like the loose sand dredged from the bottom in the same region. The calcareous cementing material seems to have been derived mainly from the shells of foraminifera in the same region. In some cases I was able to identify distinct casts of foraminifera, and in some pieces of rock distinct fossil shells were found, apparently of recent species. It is probable that these rocks belong to a part of the same formation as has been previously recorded from the fishing banks farther east. No rocks of this kind are found on the dry land of this coast."

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

H.

CATALOGUE

OF THE

AQUATIC MAMMALS

EXHIBITED BY THE

UNITED STATES NATIONAL MUSEUM.

BY

FREDERICK W. TRUE,

CURATOR OF THE DEPARTMENT OF MAMMALS, UNITED STATES NATIONAL MUSEUM.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1884.

AQUATIC MAMMALS OF THE UNITED STATES.

INTRODUCTION.

PINNIPEDIA.

THE FUR SEAL.

The following account of the Fur Seal and of the industry of which it is the basis has been condensed from the observations of Henry W. Elliott.* The northern Fur Seal, *Callorhinus ursinus* (Linné), Gray, is confined almost exclusively in the breeding season to the Pribylovs, a group of small islands in Bering Sea, about 200 miles north of Unalashka and an equal distance from the mainland, and to the Commander Islands, Bering and Copper, 185 miles east of and off the Kamchatkan coast, under Russian order and control. They settle principally upon the two larger islands, Saint Paul and Saint George, being especially numerous on the former, where they have extensive breeding and sporting or "hauling" grounds. The aggregate area of these islands does not exceed 60 square miles. They are of volcanic origin, and have a surface diversified by sand beaches, high bluffs, and lava hills. The vegetation is scant, although the climate is quite mild. About 400 Aleutes and half-breeds live on the islands, and the able-bodied men attend to the fishery in the season. The Fur Seal also occurs (or until recently did occur) in small numbers at different points along the Californian coast.

The Fur Seal grounds of the Pribylovs, as already stated, are divided into breeding-grounds and hauling-grounds. The former, which are also termed "rookeries," are located at different points about the coast of the two islands, one of the largest being at the northeastern extremity of Saint Paul's. The adult males first arrive on these grounds in small numbers early in May, and are followed by the general throng at the beginning of June, when the foggy weather of summer sets in. There is much fighting among the males for favorable situations, increasing in violence with the arrival of the females, which occurs between the 12th and 14th of June. Families of from two or three to forty or more are then made up in the midst of much fighting and confusion, each male striving to add to the number of his wives and to his neighbor's discomfort. Very shortly after their arrival the females are delivered of young. The breeding season continues until the opening of August,

* Elliott: A Monograph of the Seal Islands of Alaska. Washington, Feb. 21, 1881.

when the families show signs of breaking up, which condition becomes general by the middle of September, and the Seals are nearly all in the water. The young also begin their attempts at swimming early in August, and are ready to accompany the adults to sea during the two succeeding months. A few Seals remain late into the winter. The adult males eat nothing during the entire season, but the females go back and forth from the islands constantly. The "hauling-grounds" are frequented by the young or immature males. They are much more extensive than the breeding-grounds and of different character, principally covering level, smooth ground. The "Holluschickie," as the young males are termed, spend their time in sleeping, bathing, and procuring food, and in restless movements, hither and thither, over a large area. They show a playful and harmless disposition and do not indulge in combats with one another as do the old males on the breeding-grounds. It is from the Holluschickie that a selection is made for killing, as many of those of three and four years as possible being included. The fur in animals of this age is in the finest condition and most valuable commercially. There is apparently no diminution in the number of Seals frequenting the islands, and with a reasonable amount of watchfulness on the part of the Government there need be no fear of their extinction, unless from natural agencies at work in that part of the globe. In 1842 an unusually severe winter caused much havoc among them, and it is probable that similar conditions will produce a like effect at intervals in the future.

THE FUR SEAL FISHERY.

Shortly after the acquisition of Alaska from Russia in 1868, the Seal fishery was taken under the control of the Government of the United States and leased, August 7, 1870, to the highest bidder, the Alaska Commercial Company, at a rental of $55,000 per annum, and a tax of $2.62\frac{1}{2}$ per skin for a period of twenty years, under the provision that only a hundred thousand pelts should be taken each year. The Seals killed, as already stated, are males of three and four years, from the great hordes of "Holluschickie" which swarm over the hauling-grounds.

The work of preparing the skins is done by about eighty of the resident Aleutes who are employed by the company. The Seals selected for killing are driven away from the coast a short distance and dispatched by well-directed blows on the head. The skinning is immediately done, since a delay of even two or three hours causes serious damage to the skins by the loosening of the hair. The natives have become very skillful in this work, so that the loss of skins from bad cutting and the like does not exceed one-fourth of one per cent. The sum of 40 cents is paid for each skin prepared, and at the close of the season, when the account is settled, the amount paid out aggregates about $40,000. The fishery is at present confined to about 40 days in the earlier part of the

season, but formerly it occupied a much larger time and with a less favorable result, so far as the quality of the skins was concerned.

The annual catch of the Pribylov Islands since the opening of the American management is given by Elliott as follows:

	Number of skins.
1868	242,000
1869	87,000
1870	9,965
1871	63,000
1872	99,000
1873	99,630
1874	99,820
1875	99,500
1876	99,000
1877	85,500
1878	95,000
1879	99,968
1880	99,950
1881	85,000
1882	99,800
1883	78,000
Total	1,540,133

The catch of the Russian Islands is as follows:

	Number of skins.
1862	4,000
1863	4,500
1864	5,000
1865	4,000
1866	4,000
1867	4,000
1868	12,000
1869	24,000
1870	24,000
1871	3,614
1872	29,319
1873	30,396
1874	31,272
1875	36,274
1876	26,960
1877	21,532
1878	31,340
1879	42,752
1880	48,504
1881	42,640
1882	46,000
1883	25,000
Total	501,102

After the skins are stripped from the Seals they are packed in salt, and stowed in suitable buildings for about three weeks, after which they

are formed into packages of two skins each, the hair being out, and in this from are stowed in the company's steamers. They are counted by Government agents both at the islands and at San Francisco, after which they are shipped via New York to London, where they are plucked and dyed. The commercial value of a dyed skin varies from $25 to $75, the variation in price depending upon the fineness of the fur, and the evenness and indelibility of the dyeing.

It will be noticed that the same number of skins is not taken every season; this is due to the fact that the Alaska Commercial Company in sustaining the trade has to agree, when the market is dull, not to take the full quota allowed by law, otherwise the prices fall and the result is loss to both parties.

SIRENIANS.

THE MANATEES.

Two species of Manatees, *Trichechus latirostris* and *T. manatus*, occur on our Southern coast, but not abundantly. The Florida Manatee formerly ranged from the more northern part of the Atlantic coast of that State and along the Gulf coast, perhaps as far as the Mississippi River. At present it is confined to the southern part of Florida, occurring in the most inaccessible regions, and being but very seldom seen. Manatees are known to occur in the Indian River and the Saint Lucie on the Atlantic side, and are reported to occur in the Myakka, the Caloosahatchie, and other small rivers and streams south of Charlotte Harbor on the Gulf coast. It is doubtful whether any occur to the westward of Florida at the present time, except perhaps in Texas, where the species is probably the South American form. There is credible testimony to the appearance of a specimen near Saint Augustine, Fla., in 1874. The Florida Manatee is frequently stated by travelers to have a length of 12 or 13 feet, but I do not know of any reliable measurements of individuals of such great length. On account of the rarity of these animals there is no regular industry connected with them, although their flesh is said to be excellent meat and their hide forms an impervious leather. The best observations on the habits of these animals relate to specimens in zoological gardens and may not be quoted here. The Florida Manatee should be carefully protected from destruction or it will inevitably become extinct in a few years.

THE RHYTINA.

As the Rhytina does not occur on the coast of the United States or off any of its outlying provinces, it can scarcely claim attention in this connection. A specimen was, however, sent to the Exhibition from Bering Island, being one of a valuable collection made by Dr. Stejneger at that place. There is very little new to add to the history of the spe-

cies. The story of its discovery by Steller in 1741 and of its extinction in 1780 (or, if we may believe Eskimo testimony, in 1854) has often been related and is well known. It is doubtful whether any new information will hereafter be obtained. The quest for bones, also, has been so great of late years that, doubtless, in a short time it will be well-nigh impossible to collect more of these relics.

CETACEANS.

The methods of the American Whale fishery are thoroughly reported upon by Mr. James Temple Brown, and the statistics by Mr. A. Howard Clark, in another section of this Catalogue, and it only remains to speak briefly of these animals from a zoological point of view. It is a somewhat difficult matter in the present state of knowledge to determine how many species actually inhabit the waters surrounding North America. The difficulty is of a twofold character. Many species have been described from a single specimen, and while this does not in any way invalidate their claim to recognition, the lack of material often leaves room for the suspicion that they represent abnormalities or extreme variations of known species. On the other hand, the defects in the published descriptions and figures of even well-known forms, often lead to the creation of new species devoid of value. A third hinderance arises from the frequent confounding of localities. The number of species frequenting North American waters, including cosmopolitan and doubtful forms, does not exceed sixty-two. The numerical relations of these forms to the east and west coasts of the continent are somewhat as follows:

Total number of species inhabiting North America (including cosmopolitan and doubtful species)	62
Whalebone whales	17
Toothed whales	45
Cosmopolitan and circumpolar species	4
Species occuring on the east coast, but not on the west coast	36
Species occuring on the west coast, but not on the east coast	22
Doubtfully included in the fauna	7

It is altogether probable that after further comparisons have been made the number of species supposed to be peculiar will be materially reduced. On the other hand, the discovery of new species in the Gulf of Mexico and the Alaskan Seas may be expected when those bodies of water have been more thoroughly explored. The attempt is made in the following table to show what species occur off the coasts of North America, respectively; what are common to both shores, and what inhabit both the Northeastern and Northwestern Atlantic. To the names of species doubtfully included in the fauna is prefixed the mark of interrogation, while the double-dagger is placed before the names of those

which are doubtfully common to both the Northeastern and Northwestern Atlantic:

Species occurring in the Northeastern Pacific but not in the Atlantic.	Species occurring in both the North Pacific and North Atlantic.	Species occurring in the Northwestern Atlantic but not in the Northeastern Atlantic nor in the Pacific.	Species occurring in both the Northeastern and Northwestern Atlantic.
Balæna Sibbaldii	Balæna mysticetus		Balæna mysticetus.
			Balæna biscayensis.
Balænoptera Davidsoni			Balænoptera rostrata.
Balænoptera velifera			Balænoptera musculus.
			Balænoptera robustus.
Sibbaldius sulfureus		Sibbaldius tuberosus	‡Sibbaldius laticeps.
		Sibbaldius tectirostris	
Megaptera versabilis		Megaptera bellicosa	Megaptera boops.
Rhachianectes glaucus		Agaphelus gibbosus	
	Physeter macrocephalus		Physeter macrocephalus.
Kogia Floweri		Kogia Goodei	
Ziphius Bairdii			Hyperoodon rostratum.*
			Ziphius cavirostris.
			‡Mesoplodon Sowerbiensis.
Berardius Grebnitzki		Hyperoodon semijunctus	
Grampus Stearnsii			Grampus griseus.
	Monodon monoceros		Monodon monoceros.*
	Delphinapterus catodon	Delphinapterus declivis*	Delphinapterus catodon.
		Delphinapterus concretus.*	
		Delphinapterus rhinodon.*	
Globiocephalus Scammoni.		Globiocephalus brachypterus.	Globiocephalus melas
Phocæna vomerina		Phocæna brachycion	
		Phocæna lineata	
Orca pacifica			Orca gladiator.*
Orca atra			
Orca atra var. *fusca*			
Orca rectipinna			
Leucorhamphus borealis			
Delphinus Bairdii		Delphinus erebennus†	‡Delphinus euphrosyne.*
? Delphinus styx		Delphinus janira	Delphinus delphis.
? Delphinus albirostratus			Delphinus acutus.*
Lagenorhynchus obliquidens.			Delphinus albirostris.*
Lagenorhynchus tricolea		Lagenorhynchus gubernator.	Lagenorhynchus leucopleurus.
		Lagenorhynchus perspicillatus.	
Tursiops Gillii		Tursiops subridens	Tursiops truncatus.
		Steno fuscus	

*Recorded in the Western Atlantic only from Greenland.

†"*Delphinus bombifrons*, Cope," of the catalogue of the Philadelphia Exhibition of 1876, is a fictitious species.

THE ECONOMIC VALUE OF THE CETACEANS.

Among all Cetaceans the size of a species has a direct bearing upon its economic importance. Oil being the principal product furnished by these animals, their commercial value depends to a large degree upon the relative amount of that product which they furnish. The subcutaneous layer of fat or "blubber," which is very extensive in the larger forms, such as the Baleen Whales, becomes insignificant in amount in the Dolphins and Porpoises, and the latter are therefore comparatively valueless. Among species of about equal proportions, a secondary element of value depends upon the quality of the oil furnished. Sperm oil has a higher commercial value than oil from Baleen Whales, and

Grampus oil is esteemed more highly than that from the Blackfish. The amount of oil furnished by some of the more important Cetaceans is approximately as follows:

Species.	Length.	Amount of oil.
	Feet.	
Sperm Whale (*Physeter macrocephalus*)	80 to 84	60 to 150 barrels.
Bowhead Whale (*Balæna mysticetus*)	45 to 58	75 to 200 barrels.
Pacific Right Whale (*Balæna japonica*)	60	130 barrels.
Gray Whale (*Rhachianectes glaucus*)	35 to 44	20 to 70 barrels.
Atlantic Humpback (*Megaptera boops*)	45 to 50	35 to 60 barrels.
Blackfish (*Globiocephalus melas*)	15 to 20	20 gallons to 10 barrels.
Grampus (*Grampus griseus*)	15 to 20	
White Whale (*Delphinapterus catodon*)	15 to 16	100 to 120 gallons.

The secondary products furnished by the Cetaceans are whalebone, spermaceti, ivory, ambergris, leather, and meat. The whalebone furnished by at least three species which are or have been pursued by our whalemen rises in value almost to that of the oil secured. The Bowhead Whale, *B. mysticetus*, furnishes from 500 to about 3,000 pounds of whalebone, the Pacific Right Whale, *B. japonica*, about 1,800, and the Atlantic Right Whale, *B. biscayensis*, about 1,000 pounds. The spermaceti of the Sperm Whale, once so valuable, has greatly declined in importance. The amount furnished by a single whale varies from 15 to 25 barrels. A similar substance occurs in small quantity in the head of the Pigmy Sperm Whale, genus *Kogia*, and in the Bottlenose Whale, *Hyperoodon*. Ivory is furnished to a considerable amount only by the Sperm Whale. Ambergris is still sought for and commands a high price. About the only Cetacean leather now used in commerce is furnished by the White Whale. This species is so rare on our Atlantic coast that its importance in this connection is insignificant. The business is, however, pursued by the Canadians to some extent. Formerly leather was made from the Porpoises, which are very common about Long Island, and the industry has been renewed at Cape May, N. J. Before canned meats were introduced into commerce, the smaller Cetaceans furnished a supply of fresh meat for the crews of vessels engaged in long voyages, and is frequently referred to in the accounts of such expeditions. The flesh is not unpalatable, although inclined to be oily and tough. That of certain species, however, as the Bottlenose Whales, possesses cathartic properties which render it disagreeable and unwholesome. The American aborigines, both Indians and Eskimos, have learned the value of the wholesome species, and hazard much to secure the flesh and blubber, of which they are very fond.* The statistics of the principal products furnished are treated of at length by Mr. Clark in Section E and need not be dwelt upon here.

THE DECREASE IN THE ABUNDANCE OF AMERICAN CETACEANS.

That there have been great changes in the abundance and movements of the larger Whales along the east and west coasts of the United States

* See Section E, pp. 90 *et seq.*

within the last two centuries, history plainly testifies. During the seventeenth century shore whaling was carried on from Massachusetts to Virginia and southward, and the abundance of Cetaceans is evidenced by the innumerable disputes which arose regarding stranded animals or "drift fish." By the middle of the eighteenth century, on account of the vigor with which the fishery was prosecuted, the Whales seem to have kept off shore, near the edge of the Gulf Stream. Soon afterwards the whalemen found it necessary to go farther from port. They went northward to the Gulf of St. Lawrence and the Straits of Belle Isle, and southward to the West Indies and Brazil, and extending their voyages year by year, it was not long before they had visited all waters of the globe.

On the Pacific coast there have been similar changes. The migrations of the Whales have been over different courses in an interrupted and much more irregular fashion than formerly.

DOLPHINS.

Dolphins of three distinct genera, *Delphinus*, *Tursiops*, and *Lagenorhynchus*, are of not infrequent occurrence on both coasts of the United States. The common Dolphin, *D. delphis*, is taken from time to time, but does not appear to be particularly abundant, and has not been definitely reported south of New England. Baird's Dolphin, *D. Bairdii*, is not uncommon on the coast of California, but is not known to occur off Alaska. The species of *Lagenorhynchus*, known as the Skunk Porpoise, *L. perspicillatus*, is very common off New England and much farther north, especially about the fishing-banks, and this or a similar species occurs as far south as North Carolina. Schools of them sometimes strand on Cape Cod. A similar species, *L. obliquidens*, is common in the bays and harbors of California. The Bottlenosed Dolphins of the genus *Tursiops* appear to be the most common Cetaceans on the Atlantic coast. Numerous specimens have been taken at different localities between New York and Virginia. The Cow-fish of California, *T. Gillii*, has been commented upon by Scammon. It keeps well to the southward, and is sluggish and uncertain in its movements.

PORPOISES.

Two apparently distinct species of Porpoises, *P. brachycion* and *P. lineata*, are common in our Atlantic harbors along the entire coast. One of these species, though I have been unable as yet to determine which, ascends the larger rivers for a very considerable distance. Both these animals and the common Pacific Porpoise, *P. vomerina*, are esteemed by the Indians as dainties, and are pursued by them with considerable vigor. Like the eastern species the Pacific Porpoise has a wide range, extending at least from the Columbia River to Piginto River, Mexico.

The Atlantic Porpoise was formerly the object of a considerable fish-

ery off Long Island, where it abounds in great numbers. It was captured for its oil and also for its skin, which makes a tough and tolerably good leather. A company has been organized for a similar purpose at Cape May, New Jersey.

THE BLACKFISH AND THE GRAMPUS.

The Blackfish, *Globiocephalus melas*, was formerly very abundant on the New England coast, and seems to have attracted attention since colonial times. Within the last half century large schools have stranded almost annually, the number in a certain school in 1874 amounting to 1,405, furnishing 27,000 gallons of oil. So great was the regularity of the appearance of these animals about Cape Cod that a company was formed for the purpose of extracting oil from them, and was quite successful for a number of years. At present there seems to be much less regularity in their movements. Blackfish occur along the coast at least as far as Virginia, but little is known about them in their southern habitats. The Virginia Blackfish is believed by Professor Cope to be a distinct species, which he has designated as *G. brachypterus*. *G. Scammoni* of the Pacific coast is common along the coast of California and Lower California, but is not captured to any considerable extent. They were spoken of by Colnett in 1798 as occurring near Lower California in great numbers.

The common Grampus, *Grampus griseus*, is not an infrequent visitor on the New England coast. The number captured within the last forty years is estimated by Captain Cook to be not more than fifty. The oil is much esteemed and commands a high price.

THE KILLERS.

Killer Whales are not uncommon on both our east and west coasts. The Atlantic species, which is probably *Orca gladiator*, is frequently seen on the New England coast, and in the fall enters the harbors. They are occasionally captured at Provincetown, but with no regularity. The Killers of California, representing two species, *O. atra* and *O. rectipinna*, attracted the attention of Scammon, who has furnished an interesting account of their habits and mode of attacking the Baleen Whales. They range along our entire Pacific coast, going in small schools, which present an odd appearance on account of the high dorsal fin.

THE SPERM WHALE AND THE PIGMY SPERM WHALE.

The Sperm Whale occurs regularly in but two localities off the coast of the United States, the "Hatteras ground," east and north of Cape Hatteras, and the "Charleston ground," off the coast of South Carolina. They occasionally strand at various points, a school of eleven having perished on the coast of Florida in 1882. If I am properly informed, another school stranded near the same place the preceding year. In

the Pacific, as is well known, they formerly occurred in great abundance, but their number, at least off our coast, has suffered a remarkable diminution.

The Pigmy Sperm Whales, of the genus *Kogia*, are very rare about North America. The stranding of only three specimens is authentically known, one at Mazatlan, at the mouth of the Gulf of California, one on the New Jersey coast, and another near Indian River, Florida. Nothing is known of their movements or habits, but it may be surmised that they move singly or in pairs, but never in schools.

ZIPHIOID WHALES.

The Bottlenose Whales, genus *Hyperoodon*, are uncommon about the coast of the United States, and attract no attention from a commercial point of view. Specimens from the east coast have been taken in a few instances, and are preserved in different museums. They are not mentioned by Scammon as having been observed by him, and are doubtless very rare, if occurring at all, on our west coast.

The genera *Ziphius* and *Mesoplodon* are still rarer in North American waters. A single specimen of each genus has thus far been recorded. The discovery of a *Ziphius* and a *Berardius* at Bering Island by Dr. Leonhard Stejneger is a very interesting one, as extending the range of these genera.

THE GRAY WHALE.

The Gray Whale, *Rhachianectes glaucus*, was very abundant on the west coast of the United States and southward in the first half of the present century, and formed he object of pursuit by whalemen. In the last thirty years, however, it has diminished in abundance in an alarming degree, and is even threatened with extinction. In former years it ranged from 20° north latitude to the Arctic regions, breeding on the Lower California coast. They perform regular migrations, passing northward in the spring and southward at the approach of winter. Although far from timid, naturally, they speedily became so by the constant persecution of the whalemen, and made many changes in their habits. In passing to and fro along the shore they at first kept well in, but as they grew more cautious they deviated in their course farther and farther from the coast line, so that it was necessary for the whalemen to go out a long distance to capture them. They became very shy and difficult to catch, even under the most favorable circumstances. The breeding season occurs in the earlier part of the year, one calf being brought forth at a birth.

A single specimen showing some degree of relationship to the Gray Whale, was observed by Professor Cope and described by him under the name of *Agaphelus gibbosus*. Nothing is known of its habits or economy.

FIN-BACKS AND SULPHUR-BOTTOMS.

Several species of the genera *Balænoptera*, *Sibbaldius*, and *Physalus* occur on the east and west coasts of the United States, but so far as their habits are concerned, are but imperfectly known. They are so swift in their movements as to be rarely captured by the fishermen, and most of the specimens in the museums are those of stranded animals.

HUMP-BACKS AND RIGHT WHALES.

The Atlantic Hump-back Whale, *Megaptera boops* (or *M. osphyia*, Cope), is doubtless the commonest Baleen Whale of our shores. It frequently enters the harbor of Provincetown, Massachusetts, but not so commonly as in former years. There is a small fishery for these animals in the Gulf of Maine, which has proved somewhat successful. The Hump-back of the Pacific, *M. versabilis*, is reported by Scammon to perform regular migrations, going far into South America. They occur off the coast of California, but not in great abundance.

The Black Whale, *Balæna biscayensis*, is believed to have been the object of a very considerable fishery in the early colonial times, but has disappeared entirely for many years. Its reoccurrence has been recorded by Dr. Holder. It appears to range along the entire east coast of the United States.

I am informed by my friend, Dr. Manigault, that his statement of the abundance of this species off the coast of South Carolina* was due to a misunderstanding. The species referred to is probably a *Megaptera*.

---

* Bull. Amer. Museum Nat. History, 1, No. 4, 1883, p. 104.

ANNOTATED LIST OF THE AQUATIC MAMMALS OF NORTH AMERICA, WITH CATALOGUE OF SPECIMENS EXHIBITED AT LONDON.

Order SIRENIA.

Family TRICHECHIDÆ.

Trichechus latirostris (Harlan), True. Florida Manatee. East and west coasts of Southern Florida.

Trichechus manatus, Linné. South American Manatee. Texas to Saint Matthew's River, Brazil.

Order CETE.

Suborder DENTICETE.

Family DELPHINIDÆ.

? *Steno fuscus*, Gray. Cuba.

This species has not been properly characterized, and should, perhaps, be ignored.

Delphinus Bairdii, Dall. Baird's Dolphin. Coast of California.

15403. Photographs of skull. San Gabriel River, California. Explorations west of 100th meridian. Lieut. E. Bergland, U. S. A.

? *Delphinus styx*, Gray. North Pacific (Gray).

Doubtfully included in our fauna.

? *Delphinus albirostratus*, Peale.

Doubtfully included in the fauna.

Delphinus janira, Gray. The Janira. Newfoundland (Gray).

? *Delphinus euphrosyne*, Gray. North Atlantic.

This species is included in the Greenland fauna by Dr. Brown, but apparently without proper proof.

Delphinus delphis, Linné. Common Dolphin. North Atlantic Ocean.

Several specimens taken on our coasts have been identified with this common European species, by different observers.

13342. Cast. Wood's Holl, Massachusetts. U. S. Fish Commission.

13342. Cast of head. Wood's Holl, Massachusetts. U. S. Fish Commission.

13343. Cast of head. Wood's Holl, Massachusetts. U. S. Fish Commission.

16531. Skull. Wood's Holl, Massachusetts. U. S. Fish Commission.

Delphinus acutus, Gray. Eschricht's Dolphin. North Atlantic Ocean. Included by Professor Flower in the fauna of Greenland. (Arctic Manual, 1875.)

Delphinus albirostris. White-beaked Bottlenose. North Atlantic Ocean. Included by Professor Flower in the fauna of Greenland. (Arctic Manual, 1875.)

Leucorhamphus borèalis (Peale), Gill. Right Whale Porpoise. Pacific coast of North America.

Lagenorhynchus leucopleurus (Rasch), Gray. North Atlantic.

Lagenorhynchus obliquidens, Gill. Striped or Common Dolphin. Pacific coast of the United States.

? *Lagenorhynchus tricolca*, Gray. West coast of North America. It is doubtful whether this species should be recognized as belonging to the North American fauna.

Lagenorhynchus gubernator, Cope. Skunk Porpoise. Coast of New England.

The original figure of this species is wrongly named *L. perspicillatus* (Proc. Acad. Nat. Sci., Phila., 1876, Pl. IV). In the description (l. c., p. 138) the name *L. bombifrons* is synonymous with *L. gubernator*.

12939. Cast. Cape Cod, Massachusetts. U. S. Fish Commission.

Lagenorhynchus perspicillatus, Cope. Coast of New England.

Tursiops Gillii, Dall. Cow-fish. Pacific coast of the United States.

Tursiops erebennus (Cope), Gill. Black Dolphin. Atlantic coast of the United States.

Delphinus erebennus, Cope, Proc. Acad. Nat. Sci., Phila., 1865, p. 281.
Tursiops erebennus, Gill. Bull. U. S. Nat. Mus., 14, 1879, p. 10.

Nothing is known of the economy of this species. One of the specimens referred to by Professor Cope was from Red Bank, New Jersey. The specimen in the National Museum labeled *D. erebennus* does not agree with the original description.

Tursiops subridens, True (MS.). New York to Virginia.

A number of specimens of this species have been recently taken. The species closely resembles *T. truncatus*, Gray, but the beak is relatively shorter. It may prove identical with the latter.

13317. Cast ♂. Cherrystone Point, Virginia. U. S. Fish Commission.

13317. Cast of head ♂. Cherrystone Point, Virginia. U. S. Fish Commission.

13318. Cast of head ♀. Cherrystone Point, Virginia. U. S. Fish Commission.

16504. Skull. Cherrystone Point, Virginia. U. S. Fish Commission.

Tursiops truncatus, Gray. Bottle-nose. Dolphin, North Atlantic Ocean.

Orca gladiator (Bonnaterre), Gray. Atlantic Killer. Atlantic Ocean.

It is probably this species which enters Cape Cod Bay.

Orca atra, Cope. Pacific Killer. Pacific coast of North America.

16625. Jaws. Cape Flattery, Washington Territory. James G. Swan.

Orca rectipinnis, Cope. Coast of North America.

I am informed by my friend, Mr. William H. Dall, that this and the preceding *Orca* are seen in the same school. It is his opinion that they are varieties of a single species.

?*Orca pacifica*, Gray. North Pacific Ocean.

Globiocephalus melas (Traill). Blackfish. North Atlantic Ocean; Mediterranean Sea. A common species on the coast of New England. Large schools frequently strand.

12479. Cast. Cape Cod, Massachusetts. U. S. Fish Commission.

12840. Cast. South Dennis, Massachusetts. U. S. Fish Commission.

12841. Cast of head. South Dennis, Massachusetts. U. S. Fish Commission.

14360–61. Skull, with mandible. Cape Cod, Massachusetts. Vinal N. Edwards.

Globiocephalus brachypterus, Cope. Coast of New Jersey; mouth of Maurice River, New Jersey. (Cope.)

Only two specimens have been identified with this species.

Globiocephalus Scammoni, Cope. Pacific coast of North America and southwards.

9074. Photographs of skull and lower jaw. Coast of California. Capt. C. M. Scammon.

It is doubtless to this species that Colnett refers. (Voyage into the Pacific, 1798.)

Grampus Stearnsii, Dall. Mottled or White-headed Grampus. Pacific coast of North America.

Grampus griseus (Cuvier), Gray. Grampus. North Atlantic Ocean.

Comparatively rare; probably not more than 50 specimens have been taken on the New England coast within the last forty years. (Captain Cook.)

12760. Cast of head. Cape Cod, Massachusetts. Vinal N. Edwards.

———. Cast of head. Cape Cod, Massachusetts. Vinal N. Edwards.

Delphinapterus catodon (Linné), Gill. White Whale. Arctic and Subarctic Seas; Provincetown, Massachusetts (Capt. N. Atwood); Yarmouth, Massachusetts (Capt. B. Lovell). Occasionally captured about Cape Cod.

12490. Cast.

Delphinapterus declivis, Cope. Greenland.

Delphinapterus concreta, Cope. Greenland.
Delphinapterus rhinodon, Cope. Greenland.
Delphinapterus angustata, Cope. Greenland.

The preceding four species are given on the authority of Professor Cope. It seems improbable that there are five distinct species of White Whales. The measurements of the skulls when reduced to proportions of the total length show some remarkable coincidences.

Monodon monoceros, Linné. Narwhal. Arctic Seas.

Phocæna lineata, Cope. Striped Porpoise. Atlantic coast of the United States.

13359. Cast. Cape May, New Jersey. C. L. Wheeler.

13359. Cast of head. Cape May, New Jersey. C. L. Wheeler.

Phocæna brachycion, Cope. Puffing Pig. Herring Hog. Atlantic coast. of the United States. This is one of the commonest species, frequenting the harbors and ascending the rivers.

13200. Cast. A. Howard Clark.

9157, 9164. Skulls. Eastport, Maine. Prof. S. F. Baird.

Phocæna vomerina, Gill. California Bay Porpoise. Pacific coast of the United States.

9077. Photographs of skull and mandible. Puget Sound. Capt. C. M. Scammon.

Family ZIPHIIDÆ.

Berardius Grebnitzkii, Stejneger. Bering Island.

A single skull was obtained by Dr. L. Stejneger at Bering Island and is now in the National Museum. It bears much resemblance to *B. Arnouxii*. This genus has been hitherto observed only in New Zealand waters.

Hyperoodon rostratum (Chemnitz), Wesmael. Bottle-nose Whale. North Atlantic Ocean; North Dennis, Massachusetts (Allen); Newport, Rhode Island (Cope).

This species appears to be common about Greenland, but not so on the coast of the United States.

Hyperoodon semijunctus, Cope.

A single specimen in the museum of Charleston College, Charleston, South Carolina. A sketch of the skull of this species, in my possession, convinces me that it is a *Ziphius*. Flower, Van Beneden, and other European authorities, have long held this opinion.

Ziphius cavirostris, Cuvier.

A specimen of a *Ziphius*, provisionally identified with this species, was secured through the United States Life Saving Station at Barnegat City, New Jersey, in 1883. It is a female, 19 feet 4 inches in length, and of a gray color, lightest on the back. The end of the muzzle is white.

Ziphius Bairdii, Stejneger. Baird's Bottle-nose Whale. Bering Island.

Skulls were obtained by Dr. L. Stejneger, at Bering Island, and are now in the National Museum. Closely resembles *Z. cavirostris.*

Mesoplodon Sowerbiensis, Gervais. Temperate north Atlantic; Nantucket (S. C. Martin).

Admitted into the American fauna on the basis of a single specimen, stranded at Nantucket, Mass., and identified by Louis Agassiz with this genus, and by Professor Cope with this species. The skull is now in the Museum of Comparative Zoology, at Cambridge. A *Mesoplodon* has also been recently found by Dr. Stejneger in Bering Island.

Family PHYSETERIDÆ.

Physeter macrocephalus, Linné. Sperm Whale. Temperate and tropical seas.

Eleven specimens, mostly young, stranded on the east coast of Florida, near Cape Canaveral, in the winter of 1882.

Kogia Goodei, True (MS.). Goode's Pygmy Sperm Whale. Eastern coast of the United States; Spring Lake, New Jersey; Jupiter Inlet, Florida (M. E. Spencer).

Two specimens of this animal are known, one from each of the localities above named. Of the Florida specimen only a photograph and the lower jaw have been preserved.

Kogia Floweri, Gill. Flower's Pygmy Sperm Whale. Mazatlan, Gulf of California (Grayson).

This species is founded upon the anterior portion of a single mandible and an imperfect drawing.

8016. Photographs of portion of lower jaw. Mazatlan. Colonel Grayson. (Type.)

Sub-order MYSTICETE.

Family RHACHIANECTIDÆ.

Rhachianectes glaucus, Cope. Devil-fish; Gray Whale. Pacific coast of North America.

Only two skulls of this animal are known to exist in collections. They were obtained by Mr. Dall. One was presented to the National Museum and the second to the museum of the California Academy. Two large maxillaries are also in the National Museum.

Agaphelus gibbosus, Cope. Scragg Whale. A single specimen known.

Family BALÆNOPTERIDÆ.

Megaptera osphyia, Cope. Hump-back Whale. Coast of Maine.

A single specimen, the type of the species, is in the museum at Niagara Falls. It is mounted in a very odd manner, all the vertebræ, except the atlas, being reversed. Some of the cervicals are out of order, and the phalanges are brought close together without space for cartilages. I am convinced from careful measurements that the great height of the dorsal and lumbar neural spines, on which the species is mainly based, is a misapprehension, and have little hesitation in combining it with the succeeding species.

Megaptera boops, Fabricius. Hump-back Whale. North Atlantic Ocean.

13656. Photograph. Provincetown, Massachusetts. Capt. N. E. Atwood.

Megaptera bellicosa, Cope. Caribbean Sea.

Megaptera versabilis, Cope. Hump-back Whale. Pacific coast of North America.

Physalus antiquorum, Gray. Fin-back Whale; Razor-back. North Atlantic Ocean.

Balænoptera rostratus, Müller (Gray). Pike Whale (? Grampus of New England fishermen). North Atlantic Ocean.

Balænoptera velifera, Cope. Fin-back Whale. Pacific coast of North America.

Balænoptera Davidsoni, Scammon. Fin-back Whale. Northwestern coast of the United States.

? *Balænoptera robustus*, Lillejeborg. Gräsö Whale. North Atlantic Ocean.

Sibbaldius laticeps, Gray.

Sibbaldius sulfureus, Cope. Sulphur Bottom Whale. Pacific coast of North America.

Sibbaldius tuberosus, Cope. Mobjack Bay; Virginia (Cope). Only the type known.

Sibbaldius tectirostris, Cope. Coast of Maryland. Only the type known.

Family BALÆNIDÆ.

Balæna japonica, Gray. Right Whale of the Pacific. North Pacific Ocean.

Balæna biscayensis, Gray. Black Whale. Temperate North Atlantic.

Balæna mysticetus, Linné. Bowhead Whale. Arctic Seas.

Order CARNIVORA.

Sub-order PINNIPEDIA.

[Taken with modification from ALLEN's North American Pinnipeds. Washington: 1880.]

Family PHOCIDÆ.

Macrorhinus angustirostris, Gill. California Sea Elephant. Coast of Southern California and Western Mexico.

Cystophora cristata (Erxleben), Nilsson. Hooded Seal. Newfoundland and Norway northward.

Monachus tropicalis, Gray. West Indian Seal. West Indies.

Halichœrus grypus (Fabricius), Nilsson. Gray Seal. North Atlantic, from Newfoundland and the British Isles northward.

Erignathus barbatus (Fabricius), Gill. Bearded Seal; Square-flipper. North Atlantic, from Newfoundland and the North Sea northward; the North Pacific.

Phoca grœnlandica, Fabricius. Harp Seal. North Atlantic, from Newfoundland and the North Sea, northward; North Pacific.

Phoca fasciata, Zimmerman. Ribbon Seal. North Pacific, from Alaska and the Okhotsk Sea northward.

13284 ♂ Mounted skin. Bering Sea. Capt. H. E. Williams.

Phoca fœtida, Fabricius. Ringed Seal. North Atlantic, from Labrador and Northern Europe to the Arctic Seas; Alaska. Siberia, and the North Pacific generally.

Phoca vitulina, Linné. Harbor Seal. North Atlantic, from New Jersey and the Mediterranean northward to the Arctic regions; North Pacific, from Southern California and Kamtschatka northward to the Arctic regions.

Family OTARIIDÆ.

Callorhinus ursinus (Linné), Gray. Northern Fur Seal; Sea Bear. Coast of California northward. Especially abundant upon the Prybilov Islands; Western Pacific, from Japan northward; Bering Island; Robin Island.

12918–34. Mounted. (Group of 17.) Prybilov Islands, Alaska. Alaska Commercial Company.

Zalophus californianus (Lesson), Allen. California Sea Lion. Coast of California.

Eumetopias Stelleri (Lesson), Peter's. Steller's Sea Lion. California to Alaska; Asia.

Family ODOBÆNIDÆ.

Odobænus obesus (Illiger), Allen. Pacific Walrus. Aleutian Islands to Point Barrow; Siberia.

Odobænus rosmarus (Linné), Malmgren. Atlantic Walrus. Labrador to Repulse Bay and Prince Regent's Inlet; Greenland; north of Europe and Asia.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

I.

CATALOGUE

OF THE

COLLECTION ILLUSTRATING THE FISHING VESSELS AND BOATS, AND THEIR EQUIPMENT; THE ECONOMIC CONDITION OF FISHERMEN; ANGLERS' OUTFITS, ETC.

BY

CAPTAIN J. W. COLLINS,
ASSISTANT, U. S. FISH COMMISSION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

TABLE OF CONTENTS.

A.—Introduction.

Page.

Statistics and history of fishing vessels 7
Statistics and history of fishing boats 12
Apparatus accessory to rigging fishing vessels 14
Fishermen and their apparel 19
Food, medicine, and shelter 21
Fishermen's log-books 22
Fishermen's widows and orphans aid societies 22

B.—Fishing craft.

VESSELS.

Rigged models:
1. Fishing steamers 26
2. Fishing ketches 26
3. Fishing schooners 27

Builders' models:
4. Fishing schooners 37

BOATS.

5. Sloop, cutter, and cat-rigged square-stern boats 45
6. Schooner-rigged square-stern boats 49
7. Square-stern row-boats 50
8. Sharp-stern round-bottom boats 50
9. Flat-bottom boats 54
10. Portable boats 58
11. Sportsmen's boats 61
12. Bark canoes 62
13. Skin boats and canoes 62
14. Dug-outs 63

SKETCHES AND PHOTOGRAPHS OF VESSELS AND BOATS.

15. General views of fishing fleets 65
16. Fishing steamers 66
17. Square-rigged vessels. 67
18. Fishing schooners 67
    Pinkeys 67
    Mackerel-fishing vessels 68
    Cod-fishing vessels 70
    Fresh-halibut vessels 71
    Herring catchers 72
    Fishing schooners, general 72

Page.
19. Sloops 73
20. Cutters 73
21. Quoddy and Block Island boats 74
22. Seine-boats 74
23. Sharpies 74
24. Dories 75
25. Bark canoes 75
26. Skin boats 76
27. Dug-outs 76
28. Ship-yards, boat-shops, &c 76

C.—FITTINGS AND APPLIANCES FOR VESSELS AND BOATS.

29. Canvas used on fishing vessels 78
30. Photographs of sail-loft and sail-maker's dwelling 78
31. Cordage used on fishing vessels 78
32. Windlasses and capstans 80
33. Steerers 81
34. Compasses, logs, &c 81
35. Books 84
36. Charts used by fishermen 84
37. Cabin lamps, lanterns, torches, &c 86
38. Lantern-boards 88
39. Fog-horns 88
40. Preservative fluids and paints 90
41. Chafing-gear 91
42. Blocks, sheaves, and dead-eyes 93
43. Hoops and hanks 97
44. Hooks, clews, thimbles, and grommets 98
Hooks 98
Clews and earings 100
Thimbles 102
Grommets 103
45. Chocks 104
46. Boat-hooks 105
Boat-hooks, unmounted 105
Boat-hooks, mounted 105
Boat-hooks, aboriginal 106
47. Leaders and lizards 107
48. Purrel-trucks 108
49. Cleats and belaying-pins 108
50. Anchors and grapnels 110
51. Mast-gear 114
52. Boat-builders' materials 115
Miscellaneous 115
Aboriginal implements 119
Rudder fixtures 121
Center-boards 122
Boat-detaching apparatus 122
Rowlocks and thole-pins 123
53. Drags or floating sea anchors 130
54. Scrapers and deck-scrubs 131
55. Scoops and bailers 132
56. Shovels 133
57. Pumps and bung-buckets 133
58. Fids, marline-spikes, and splicers 134

Page.

59. Accessories 135
Scout-horns 135
Barrel-lifters 135
Ice-hooks and mallets 136
Buckets and water-jugs 136
Boom-supporters 136
Buoys 137
Claws 137
Paddles 137

D.—Fishermen and anglers.

60. Figures of fishermen 138
61. Photographs of fishermen and fish merchants 140
62. Fishermen's wearing apparel 143
Suits of clothes 143
Trousers and overalls 144
Jackets and jumpers 145
Shirts and drawers 146
Aprons 148
Socks 148
Mittens, gloves, and nippers 148
Hats and caps 150
Oiled clothing, &c 151
Boots, shoes, and slippers 154
Bed-clothing 155
Eye-protectors 155
63. Receptacles for clothing 155
64. Anglers' wearing apparel 156

E.—Food, medicine, and shelter.

65. Fishermen's food 159
66. Fishermen's medicine 161
67. Photographs of fishermen's houses, &c 162
Fishermen's dwellings 162
Homes for families of lost fishermen 164
Dwellings of vessel owners and fish-dealers 164
Bethels and school-houses 165
Views of fishing towns 165
68. Anglers' tents and portable houses and their equipment 166

F.—Vessels' papers.

69. Vessels' papers and insurance policies 171
70. Log-books 171
Log-books kept under requirement of old bounty law 171
Log-books kept at request of the United States Fish Commissioner. 172
71. Papers of Widows' Aid Society 172

G.—Habits of fishermen.

72. Musical instruments, games, and literature 174
Musical instruments 174
Games 174
Literature 175
73. Fishermen's tools and outfits 176

H.—Life-saving material.

74. Life-boats, rafts, and mattresses 178
75. Illustrations, medals, reports 179

A.—INTRODUCTION.

STATISTICS AND HISTORY OF FISHING VESSELS.

According to the census of 1880 there were employed in the fisheries of the United States, in that year, 6,605 vessels, of an aggregate tonnage of 208,297.82 tons, valued at $9,357,282. The number of fishermen employed was 101,684, which includes those engaged in boat fishing as well as those sailing on vessels. The most important fisheries in which these are engaged are those for cod, mackerel, halibut, oysters, menhaden, herring, and the whale. There are several other fisheries of more or less consequence, but of less importance than those named above. The bulk of the fishing fleet sails from New England, from which section the whale fishery and the greater part of the ocean food fisheries are prosecuted.

The fishing fleet of a nation is an important factor in the development of its commerce as well as in its naval success. The building of fishing boats and vessels develops a taste for naval architecture which often may result in decided benefit to the country, as well as advantage to the individual. And these boats and vessels, besides accomplishing the more special objects for which they were constructed, become training ships upon which large numbers of seamen receive their technical education which fits them not only for fishermen, but also to fill positions of responsibility in other naval pursuits. It is, I believe, a well established historical fact that those nations which have enjoyed remarkable commercial prosperity and naval supremacy can trace their success in these particulars directly to their fishing industries, the pursuit of which has developed an adventurous and enterprising naval spirit in the people.

The colonization of North America was due almost wholly to the interest felt in the fisheries of the Western Atlantic, and to this cause alone may we look for the motive that induced people to settle in localities which afforded small attractions of any other kind. As a result of the tendencies of the early settlers to engage in the fisheries, a fleet of fishing vessels was employed as soon as the country was occupied.

According to the old records snows and ketches were employed in the bank cod fisheries when the business was first established, and at an early date sloops were also engaged in fishing. In the records of Massachusetts Colony, 1680, the statement is made that—

"There are about one hundred or one hundred and twenty ships, sloops, and other vessels that trade to and from hence, yearly, of our own or English build, most of them belonging to this colony. Wee have eight or ten ships [probably snows] of one hundred tons or more, and about forty or fifty fishing ketches of betwixt twenty and forty tons.

Six or eight English ships do usually come hither yearly belonging to the Kingdom of England, bringing commodities of all sorts from thence."

The so-called ketches were probably employed to a greater extent than any others. These vessels were full and heavy built, with a peculiar rig that was at first invented for a bomb vessel (the mainmast standing about amidships to give room for ordnance forward), but afterwards came into great favor for yachts and fishing crafts. The snows were generally larger than the ketches, square-rigged on two masts, and having a small jiggermast at the stern. A distinguishing feature of the sloops of the early colonial times was that many if not most of them carried square topsails. These were, of course, better adapted for fishing near the land than for making extended cruises to the banks.

The first marked improvement in the American fishing vessels was the invention of the schooner rig early in the eighteenth century. The difficulties attending the adoption of a new rig in former times is evidenced by illustrations of war ships of the eighteenth century, and previously, on which lateen sails were carried on the mizzen. Illustrations of French men-of-war in 1764, however, show that the portion of the sail forward of the mast was no longer carried, probably owing to the difficulty of lowering and shifting the yard whenever the ship changed her tack. The yard was nevertheless kept its full length, simply, it would appear, because no one could invent a gaff, or similar device, to take its place. We may, therefore, look upon the invention of the schooner rig, which has now become so popular in America, as a matter of special importance in the history of our fishing fleet. The particular incident which gave to this rig the name of schooner is thus described:

"Captain Robinson built and rigged a *ketch*, as they were then called, masted and rigged it in a new and peculiar manner; when launched the peculiar motion she made as she glided into the water from the stocks caused one of the by-standers to exclaim, 'Oh, how she *scoons*.' Robinson instantly dashed a bottle of rum against her bow and exclaimed, 'A scooner let her be!' And thus the schooner originated."

This event happened in Gloucester in 1713, according to the historical account, and as early as 1716 mention is made of the employment of a "scooner" in the fisheries off Cape Sable, Nova Scotia, and it is possible this may have been the original one built by Captain Robinson.

The schooners employed in the Grand Bank cod-fisheries from New England—chiefly from the port of Marblehead, Mass.—previous to the War of Independence, were full built, round-bodied craft, specially noted for having short and high quarter-decks, from which peculiarity they derived the appellation of "heel-tappers," at a later date, when a different type of fishing vessel came into general use. Previous to 1775 Marblehead had a fleet of more than one hundred and fifty fishing schooners, while it is stated that as early as 1701 Gloucester had a fleet of seventy vessels employed in the Grand Bank cod-fisheries. Many of

the largest of the New England fleet made winter voyages to Spain—chiefly to Bilboa—where they carried the products of their summer's fishing and returned home laden with European goods. In this way the spirit of adventure was stimulated and increased, and many of the New England fishermen became very skillful seamen.

The period between 1775 and 1815, during which time occurred the war of the Revolution, the embargo act, and the war of 1812–'15, was a very unfavorable one for the American fisheries. The larger class of fishing vessels, those which had been employed on the Grand Bank and other distant fishing grounds, were compelled to lie idle, while, in most cases, the hardy men who had composed their crews were employed in the Army or Navy. The fishermen, impoverished by the long struggle for independence, were unable, after the peace of 1783, to build and equip large vessels, therefore they provided themselves with smaller craft, in which they fished on the grounds in Massachusetts Bay and adjacent waters. This was the period when the "Chebacco boat" came into general use. These peculiar boats derive their specific name from Chebacco, now a part of the town of Essex, Mass., where they originated. At first they were generally sharp aft, with a "pink" stern, usually only partially decked—being what were called "standing-room boats"—with two masts and two sails. Later they were built larger, rarely, however, so large as 20 tons, and decked, while many were made with square stern and nicknamed "Dogboddies." About 1820 the fisheries began to gain in prosperity, the size of the sharp-sterned craft increased, a bowsprit with a jib was added, and a new style of fishing vessel, the "pinkey," was the result. Though in the meantime some square-sterned vessels were employed, the pinkey remained in most general use until about 1840, when the low quarter-deck, but still full-bowed schooner, was extensively introduced.

The second great event in the history of the American fishing fleet was the change from blunt to clipper schooners. It is claimed by some authorities—seemingly with good reason—that the changes made in the models of our fishing vessels was the source from which sprung the famous American clipper ships which at one period made our merchant marine so justly celebrated, both for its vessels and the superior seamanship of their officers and crews.

The requirements of the mackerel fishery and of the oyster trade made swift sailing vessels a necessity, and about 1845 ambitious builders began to make some changes. It was not, however, until 1847 that the first really sharp vessel—the Romp—was built, and it is a matter of record that men were at first afraid to go on her, though when once tried she was found to be an excellent sea boat. She has since made the passage around Cape Horn to California.

It is not practicable in this place to trace the development and changes which have taken place since 1850 in the American fishing schooner, though the subject is one of sufficient interest and seemingly

of sufficient importance to warrant its full discussion had it not received attention in another place.* Suffice it to say that after passing through various changes the clipper fishing schooner of New England is to-day second to none in beauty, speed, equipment, spread of canvas, and ability to carry sail in ordinary weather. Unfortunately, however, in the effort to attain a high rate of speed and great initial stability, so that much sail can be carried with a comparatively small amount of ballast, a rather shallow, extremely sharp vessel has been produced, with great breadth of beam, upon which she mainly depends for stability. This form, though it has certain manifest advantages, is nevertheless a dangerous one, and consequently, though we now have much larger vessels than formerly, we find that the ratio of loss by foundering at sea has increased of late years with frightful rapidity. A fruitful source of disaster is doubtless the liability of the present type of schooner to capsize or be tripped by a heavy sea, and its inability to right again, owing to the lack of a low center of gravity and an unusual length and weight of spars. While great and manifest improvements have unquestionably been made in the American fishing schooner, the writer is of the opinion—an opinion gained by practical experience as well as by study—that in departing from the relatively deeper craft of a few years ago a serious error has been committed which will not be remedied until a change is made in that direction. A study of the collection of builders' models showing the evolution of the American fishing schooner will enable one to gain a better idea of this subject than can be conveyed in the limited space at our command.

The fishing fleet possessed by a country plays a more important part in its commercial and naval success than is popularly supposed. The boy or young man who first obtains the rudiments of naval construction while endeavoring to build for himself a boat or larger craft, in which to ply his vocation, may in this manner develop latent mechanical powers which he may possess, and the result of his early training may be the producing of a ship-builder.

The third remarkable event in the history of the American fishing fleet was the employment of steamers, though steam has not yet taken so prominent a position in our ocean fisheries as one might naturally expect in an age when it has become nearly universal. The extreme swiftness of our sailing vessels, the fact that a large percentage of our ocean food-fishes are cured at sea and marketed in a salted condition, the comparative cheapness of sailing craft, and also because they can be kept at sea at far less expense, are causes which, so far, have operated to prevent the employment of steamers in any of the sea fisheries which are carried on at long distances from the land. Attempts have been made to introduce steamers into the winter haddock and the summer mackerel fisheries, but the results obtained were not satisfactory,

*A description of the fishing vessels and boats of the United States, yet unpublished.

and the regular employment of such vessels in those or kindred branches of the fisheries has apparently been indefinitely postponed.

Screw steamers were introduced for the capture of menhaden about 1871. In a description, by Boardman and Atkins, of the methods employed in the menhaden fishery about Booth Bay, Me., in 1874, it is stated that: "They [steamers] were introduced on the coast of Maine three years ago." Steamers were found remarkably well adapted for this fishery, where quick dispatch is a necessity, and the fish are taken from the great purse-seines and thrown in bulk in the vessel's hold, where they lie until they are transferred to the factory—on the arrival of the steamer in port—to be converted into fertilizers and oil. In the census year of 1880 there were 84 steamers employed in the menhaden fisheries, their aggregate tonnage amounting to 6,543.29 tons. The smallest of the fleet, and the first built for this fishery, the Seven Brothers, is 27.32 tons, while the largest, the George W. Humphries (a "double-gang steamer"), is 214.55 tons, with 250 horse-power.

Screw steamers are used to some extent in the fisheries of the great lakes. Some of these are employed chiefly in carrying to market the product of the traps and pounds, and are generally called "pound steamers." The most of them, however, fish with long strings of gill-nets and are called "gill-net steamers." There are certain local differences in these vessels, but generally speaking they resemble an ordinary steam tug, being, however, somewhat wider and rather flatter on the floor. They range in size from 10 to about 45 tons.

A few years ago steamers were introduced into the oyster fisheries, and in 1881 twelve of these vessels were employed in dredging oysters in the waters of Long Island Sound, and several others were then in course of construction.

The first attempt to use steam power for oyster dredging of which we have any knowledge was made at Norwalk, Conn., when a boiler and engine were put on board the sloop Early Bird in 1874 for the purpose only of turning the drums with which the dredge lines were hauled. Later this vessel was further improved by the addition of a propeller, and this was found to add so materially to her effectiveness that since that time several screw steamers have been built expressly for this work. They are generally of small size, ranging from 20 to 63 tons, from 50 to 83 feet in length, with a beam of 12 to 20 feet.

In 1880 there were two small screw steamers, of the tug pattern, employed in the clam fisheries of the United States, one of these, however, spending a portion of her time in the "sardine" fisheries, in which, also, another small tug found employment. In the latter industry the work of the steamers consisted chiefly in towing fishing boats to and from the factories or packing establishments.

Small, light-draught, side-wheel steamers are also used to some extent for "laying out" seines in the broad shallow waters of the South, especially about Albemarle Sound.

The collection of rigged models represents the most important types of fishing vessels now employed in the United States, as well as others which are historically interesting from having been used in the early history of the country.

The series of sketches and large photographs serve to illustrate the construction, equipment, and work of the vessels, more particularly the clipper schooner of the present day, which is represented under the many varying conditions of wind, weather, and surroundings that are liable to occur in pursuing the several more important branches of our sea fisheries.

STATISTICS AND HISTORY OF FISHING BOATS.

The statistics prepared for the tenth census show that, in 1880, there were employed in the fisheries of the United States 44,804 boats, valued at $2,465,393. This fleet of boats is more evenly distributed than are the vessels, and though there are relatively more on the northeastern coast than elsewhere, fishing boats are nevertheless found in greater or less numbers in all sections of the country where quantities of fish may be taken.

The fishermen of the United States, until within a comparatively short time, have shown a decided preference for sharp-sterned boats, a preference which I believe is very general among the fishermen of all countries. And even at the present time this type of fishing boats is, perhaps, in most general use in American waters. At the same time, however, various forms and rigs of square-sterned boats have been adopted by the fishermen within the present century, and most of these have met with local favor at least, while others have become so celebrated for speed that their fame has extended far and wide. It is a somewhat remarkable fact that the most popular forms of small yachts on the Atlantic coast have been modeled and rigged like fishing boats, and it is by no means an unknown event for fishing boats to engage in regattas and carry off the honors of the occassion. The cat-rigged fishing boats in the vicinity of Newport, Rhode Island, and Martha's Vineyard, Massachusetts, and the small sloops of Southern New England and of Maine furnish the favorite types for yachtsmen to copy. Both of these forms have gained a wide celebrity for speed both in the United States and in other countries. In England the cat boat of this type is known as the "Una," boat, this special form having taken its name from the American boat "Una" which, a few years ago, created a great sensation in British yachting circles by her wonderful performances.

The cat rig, the sloop, and the schooner are the favorite rigs among the native American fishermen. The cutter rig has been introduced by the Irish fishermen sailing from Boston, Mass., while along some parts of the coast of the Gulf of Mexico, and in California, the fishermen,

many of whom are natives of Southern Europe, have brought with them their native prejudices in favor of the lateen rig. The lug rig has never been a favorite one in the United States.

There are many varieties of flat-bottomed boats used in the fisheries of the United States, the most important of these being the American dory. For various reasons, this type of boat, though somewhat unprepossessing to look at, has come into great favor for sea fishing.

The dory is found more convenient for stowage on the deck of a vessel than any other boat, since several can be "nested" together; it is light and convenient to handle, "burdensome," can be built at small cost, and is one of the safest boats used in the fisheries. At least three dories have crossed the Atlantic, one of which—the Little Western—was only 13½ feet long on the bottom.

The dory originated in Newburyport, Mass., about the beginning of the present century. At first boats of this build, but of larger size than those employed in the fisheries, were used as lighters for discharging cargoes of sugar and molasses from vessels arriving from the South or the West Indies. Dories were used in the fisheries comparatively little until 1850, but with the introduction of the trawl-line fisheries these boats came rapidly into favor, and of late years have been very generally adopted by the fishermen of the British Provinces of North America and also by the French, who resort to the Grand Banks of Newfoundland.

The sharpy, used in the oyster and other fisheries, is a very serviceable form of boat in localities where the waters are generally shallow. Provided with center-board and sails, they are frequently swift sailers in smooth water, and on certain parts of the Atlantic coast boats of this type are in high favor as small yachts.

The "pound boat" of the Great Lakes is a variation of the sharpy pattern, but is made of extra width in order that it may be adapted to its work. As a matter of fact, a fisherman's boat is usually as good an illustration of the adaptation of means to ends as can be found. The Eskimo of the far north, where wood is not obtainable, builds his kyak or bidarka of the skins of such animals as he can capture. The tribes living on the northwest coast of America, in regions where forests of large trees grow, construct for themselves boats dug out of the solid wood, while other Indians make boats of the bark of trees, birch bark being the favorite material among many North American tribes. Among white men we find even a greater diversity. And in a country having such an extensive area as the United States, with all the varying conditions of climate, weather, and local surroundings, having within its limits fishermen from almost every country under the sun, it is not at all surprising that a remarkable variety of form and rig should exist in fishing boats. It is not, however, possible to discuss this subject here, even in the briefest manner, the time and space at our com-

mand not permitting of anything more than to make a bare allusion to the matter.

The collection of models and full-sized specimens of fishing boats, rigged or otherwise, portable boats, canoes, kyaks, dug-outs, &c., represent the more interesting forms of small craft used for fishing in the United States. Sketches and large photographs illustrate the construction and work of many of these boats, canoes, &c.

APPARATUS ACCESSORY TO RIGGING FISHING VESSELS.

Very marked improvements have been made in the fittings and appliances of fishing vessels since 1830. Previous to that time the vessels had no stoves; the cabins were roughly finished, and cooking was done in a small fire-place. The vessels were steered with tillers, as a rule, none of the many varieties of patent wheels used on fishing vessels having been invented at that date, while the patent windlass, now considered indispensable, was unknown to fishermen, who were obliged to perform the heavy work of heaving up their anchors on the banks with the old-fashioned windlasses, worked by handspikes.

CANVAS.

In the early days the sails were usually made of dark colored canvas (probably of hemp), which in dry weather was generally baggy, and we are told by old fishermen that few vessels at the beginning of the present century were unprovided with scout-horns with which to wet their sails when sailing close hauled. At the present time cotton canvas is exclusively used on American fishing vessels, and the fishermen of the United States are much prejudiced in its favor. Its comparative cheapness, its whiteness, and the fact that it will set very flat are merits which tend to bring it into high repute, more especially on the clipper fishing vessels, on which dark colored or baggy canvas would not be tolerated. About 40 per cent. of the canvas used on the Gloucester fishing fleet is what is known as the "medium"—a quality of duck about half way between the hard and soft grades.

The following will give an idea of the weight of canvas carried by the fishing schooners of New England:

Canvas used for three lower sails, namely, mainsail, foresail, and jib, all of which are usually made of the same kind of duck: Nos. 1 and 2 for vessels of 70 to 90 tons; No. 2 for vessels of 60 to 70 tons; Nos. 3 and 4 for vessels of 50 tons; No. 5 for vessels of 40 tons; No. 6 for vessels of 20 tons.

Canvas used for light sails: Nos. 6 and 7, for flying jibs for vessels 65 to 90 tons; Nos. 9 and 10 used for staysails and gaff-topsails for schooners 60 to 80 tons; 8 ounce duck used for balloon jib for schooner of 90 tons, the same size for staysails on smaller vessels; 6½-ounce twill for balloon jib for schooners of 70 to 80 tons.

CORDAGE.

As to the cordage used, the standing rigging is generally of hemp and wire, though the latter is not so much in favor on fishing vessels as on those engaged in other pursuits. Manila is universally used for running rigging, and very generally for cables to ride by on the fishing banks. Thirty to fifty years ago hemp cables were generally carried, but manila has almost, if not entirely, superseded hemp for this purpose. Much care is taken to fit the rigging of the clipper schooners in a neat and workmanlike manner, and in this respect they can compare very favorably with the best rigged yachts.

WINDLASSES.

At the present day all of the first-class American fishing schooners are provided with patent windlasses, of which there are several varieties, which, however, usually work on the same general principle. The New England fishermen were rather conservative about adopting this improvement when it was first brought to their notice some forty years ago. They feared that the iron work might break, and that they would consequently meet with much difficulty in getting their anchor. The story is told that the first Gloucester vessel to carry a patent windlass to George's Bank was watched with much interest, and on the first favorable occasion the crews of other vessels went on board of her on the bank to witness the working of the "new-fangled idea," and to satisfy themselves as to its practical utility. The improved windlasses met with great favor as soon as their usefulness was demonstrated, and all the vessels were rapidly supplied with them.

STEERERS.

As previously stated, the fishing vessels during the first three or four decades of the present century were steered almost exclusively with tillers. At the present time few are steered in that way, more particularly of the larger class, some form of the many different varieties of patent steering wheels being used.

NAUTICAL INSTRUMENTS.

A very marked change has taken place within the past forty years in the matter of providing fishing vessels with a good supply of nautical instruments. Formerly few vessels carried anything more than the ordinary compasses and a chart of the locality over which they were supposed to cruise. The majority were unprovided with quadrants, and dead reckoning was almost entirely depended on, while even this was not assisted, as a rule, by any form of log, the fishermen estimating the distance run simply by noting the motion of their vessel through the water. Barometers were practically unknown. At the

present time the most improved and valuable forms of compasses are carried; no first-class vessel is without a good barometer (the aneroid form generally being preferred); the most approved forms of patent logs, and excellent marine clocks are carried, while few, if any, vessels are unprovided with either a quadrant or a sextant, as well as a spy-glass or marine glasses. Most of the halibut schooners and some of those engaged in the cod fishery on the distant banks carry chronometers. Much of this change is due to the extremely sharp competition that now exists in the several branches of the fisheries, and the consequent need for skillful navigation both to find fish on small and isolated "spots" and to make rapid and safe passages to and from the home ports. Since the method of trawl-line fishing has now become so general, and the winter fisheries are prosecuted much more than formerly, it is necessary that barometers should be carried, in order that a better idea may be gained of weather changes than would otherwise be possible.

BOOKS.

The most approved forms of nautical books, such as navigators, nautical almanacs, coast pilots, &c., are carried on the fishing vessels.

CHARTS.

All of the first-class fishing vessels are well provided with charts of the regions over which they sail. Eldridge's charts are seemingly preferred, probably because the fishing grounds are laid down on them more distinctly than on either the Admiralty charts or those issued by the United States Coast and Geodetic Survey or by the Hydrographic Office, though the Government issues are doubtless the most accurate.

FOG HORNS.

There is probably nothing more needed by American fishermen than a powerful and efficient fog horn. Obliged to lie at anchor on the fishing banks in the direct track of commerce, especially swift steamers, and where dense fogs prevail nearly all the time in spring and summer, they are in constant danger of being run down and sunk—a danger that can be averted only by having a powerful horn that may be operated by hand. The trawl-line fisheries, too, involve the fishermen in much personal risk that can be obviated only by the use of a horn of more than ordinary power. During the prevalence of the thickest fogs the fishermen must put off from their vessels to set and haul their trawl-lines, generally going distances varying from $1\frac{1}{2}$ to 2 miles. The style of horns commonly in use cannot, of course, be heard more than a small portion of that distance, except when there is little or no wind. Therefore, in localities where the currents are uncertain as to their course, and variable in strength, where the winds are liable to change suddenly

and where the fogs are so dense and so long-continued, it is not surprising that many fishermen go astray in their boats and are exposed to untold suffering, perhaps death, owing to the fact that they are unable to hear the fog signals made on board of the schooner they have left, and which they vainly strive to find. The local papers in the fishing towns frequently record the loss of men in this manner, and the escape of others from death, simply by a hair's breadth, after enduring the most unheard of suffering from exposure, hunger, and thirst. Various devices have been resorted to to remedy this evil, such, for instance, as carrying cannon to fire in foggy weather, but heretofore these means have failed to prevent the frequent recurrence of disaster. The chief objection to cannon is, that their discharge involves a certain amount of danger as well as expense; therefore, they are not usually fired until it is deemed absolutely necessary—that is, often not unless it is thought a dory has gone astray, and then it is frequently ineffective because the lost men have got too far from the vessel to hear the sound. Another thing, the sound of a cannon is so short that its direction, even if the report is heard, is very difficult to determine. What, therefore, is needed is an implement that can give out a nearly continuous heavy blast, or a succession of short, heavy blasts, powerful enough to be heard at a considerable distance, and repeated at such short intervals that no difficulty may be experienced in determining its location.

PRESERVATIVE FLUIDS AND PAINTS.

The continued prevalence of heavy fogs on the fishing grounds off the Atlantic coast renders it difficult to prevent sails from mildewing. As a result the fishermen have used preservatives to a greater or less extent, especially on the sails of vessels engaged in the bank fisheries. Many of the Gloucester fleet have their sails so prepared as a preventive against mildew and rot.

Copper paint, of various brands, is extensively used on the bottoms of fishing vessels to prevent the planking from being injured by boring worms, and also to prevent fouling. There is probably not a single fishing vessel of any size that is not painted with copper paint on its bottom.

CHAFING GEAR.

Since the introduction of larger and more neatly rigged vessels than those which were formerly employed in the fisheries, more attention is now paid to the use of various kinds of chafing gear to prevent the rigging from being injured. The ordinary equipment of this material is represented in the collection exhibited. The strad is probably original with the New England fishermen, and is remarkably well adapted for application to a cable to prevent chafing in the hawse-pipe and across the stem and head-stays.

BLOCKS, ETC.

Many important improvements have been made in blocks, whereby greater power and compactness are obtained. The most noticeable of these improvements is the substitution of galvanized iron for the old-fashioned rope strap, the invention of patent roller bushings, and the attachment of buffers of various patterns for relieving the strain when jibing, &c.

HOOPS AND HANKS.

Various devices have been invented for the improvement of hoops and hanks, but, in rather remarkable contrast to the advance made in other directions, few, if any, of these seem to be of special practical importance. As a matter of fact, the plain oak hoops and hanks that were in use many years ago are used to-day on fishing vessels. The only exceptions to this are that galvanized-iron hoops are used on the masts of small boats to some extent, and iron hanks are, of course, attached to sails set on wire stays.

One of the best improvements, so far as fishing vessels are concerned, has been made in devising a riding sail hoop which can be easily and quickly attached to or detached from a sail, and the use of which obviates the necessity that formerly existed for using rope hoops, lacings, &c.

HOOKS, CLEWS, ETC.

In the construction and equipment of fishing vessels, the manufacture of their sails, &c., the most approved forms of apparatus are used. In such things as hooks, clews, thimbles, grommets, chocks, boat-hooks, leaders, purrels, cleats, belaying-pins, anchors, and the various other materials which enter into the construction or outfit of fishing vessels or boats, more or less important improvements have been made—one of which is, in many cases, the substitution of galvanized for black iron, the general result of which has been an increase in the strength and efficiency of our fishing craft. Though many of these improvements are of special interest and more of them deserve mention, it is not possible, owing to the great variety of these objects and the lack of space, to speak of them in detail. Nothing more can be done here than to simply call attention to the fact that in the class of objects alluded to such perfection has been attained as to materially aid in making our fishing fleet specially well adapted for the work it has to do.

DRAGS, OR FLOATING SEA ANCHORS.

The practice of carrying drags or floating anchors is unfortunately too much neglected on our fishing vessels. The object of this form of apparatus is to prevent foundering of sea-going vessels when lying to in heavy gales, especially when sails have been blown away, or when from

other causes a vessel has become unmanageable, or is lying in a dangerous position. Unless a vessel is provided in such an emergency with some sort of drag to be put out at the bow, so as to prevent her from falling into the trough of the sea, she is liable to meet with serious disaster, amounting in many cases to an entire loss of the ship and crew. It is believed by many, whose experience renders them capable of judging correctly, that a large percentage of the loss by foundering which occurs to the fishing fleet of New England might be obviated by the use of properly constructed drags. As is well known, heretofore seamen have generally been compelled in such emergencies to rely on some sort of floating anchor improvised from spare material on shipboard—such as spars, casks, &c.—the rigging of which is generally attended with much danger and delay, at a time, too, when the utmost dispatch is desirable, if not imperative. And when completed these rudely constructed affairs are rarely, if ever, found to answer well the purpose for which they were designed, shipwreck and loss of life often being the result of their faulty construction. Unfortunately, too, there is created a prejudice in the seaman's mind against using such contrivances, and unless provided with apparatus specially designed for this purpose, he must take the fearful alternative of chance to insure his safe return to port.

To obviate these difficulties various forms of drags or floating anchors have been designed. In those exhibited, one of the chief improvements attained (always, of course, supposing that any apparatus of this kind is properly shaped) is adjustability. As few, if any, vessels have sufficient spare room to stow away any drag which is not adjustable, and, as heretofore shipmasters (especially fishermen) have found it inconvenient to carry the cumbersome devices of this kind which have been made, the advantages of having an adjustable drag are evident. Such a one can be always kept on board ready for any emergency. It can be stowed in the smallest compass, and, when need be, it can be prepared for use in a few minutes.

FISHERMEN AND THEIR APPAREL.

In 1880 there were employed in the fisheries of the United States 101,684 men. Of these a large percentage were engaged in the whale fishery and in the various branches of the off-shore ocean food fisheries. These may be called the sailor-fishermen, and, as a class, they are hardy, brave, and skillful. New England has 37,043 men engaged in the fisheries, nearly all of the class above mentioned. The South Atlantic States employ 52,418 men, chiefly coast and bay fishermen. The Middle States have 14,981 men; and the Pacific States and Territories 16,803. Five thousand and fifty fishermen find employment in the great lake fisheries, and 5,131 men are engaged in the fisheries of the Gulf of Mexico.

The harvest of the seas has drawn to the United States representatives of nearly all countries, more particularly the maritime countries of Europe. The crews of the New England fishing vessels are made up, to a greater or less extent, of foreign-born men. Among these natives of the British North American provinces predominate. It is not uncommon, however, for a single crew to be composed of men from five or six different countries. As a rule, these men—provincials, Scandinavians, Danes, Germans, Portuguese, Irish, &c.—make excellent fishermen, and often rise to command.

Few negroes are employed in the New England food fisheries. Occasionally a colored cook finds a situation on a fishing schooner, but it rarely happens that a negro can find employment in any other capacity on the vessels north of Cape Cod. On the other hand, the whaling vessels of New England recruit a considerable portion of their crews from the negroes of the Canary Islands and elsewhere, from the Indians of the Pacific islands—chiefly Kanakas of the Sandwich Islands; from the Gay Head tribe of Indians, and perhaps from various other sources where colored men are obtained in somewhat less numbers.

South of New York the fishermen are almost wholly American born. In the Southern Atlantic States a large percentage of the fishermen are negroes. On the west coast, Italians, Greeks, and Chinese predominate—of course excepting Alaska, where the native Aleuts are almost the only fishermen. A few vessels, manned chiefly by New England fishermen, engage in the cod fisheries from San Francisco, Cal., making extended cruises to Ochotsk Sea and the Shumagin Islands on the Alaskan coast. The typical New England sailor-fisherman ranks ahead of all others in skill, daring, and enterprise. From the ranks of his class have been drawn some of the most intelligent and successful masters in our merchant marine, while it is worthy of mention that skippers of fishing schooners left their little vessels during the war of the Rebellion to join the Navy, in which service they filled honorable and responsible positions.

The clothing ordinarily worn by American fishermen has little to distinguish it from the apparel worn by any other class of sea-faring men. There are none of the peculiar characteristics in dress which are so noticeable in European countries, where fishermen can usually be easily selected from other men simply by their costumes. When on shore and off duty a New England fisherman might be mistaken for a merchant, a mechanic, a lawyer, or indeed, as a representative of any other class of landsmen, if judgment was to be based on the style of his dress—his "shore togs," as he would term them, differing in no particular from those worn by men engaged in other pursuits. The jumper, which is quite generally worn as a substitute for a light jacket or coat, is a garment peculiar to the fishermen, or at least worn more extensively by them than by any other class, though it is also worn to some

extent, I am informed, by the farmers of New England and possibly of other sections of the country.

The rubber and oil clothing manufactured in New England for fishermen's wear is not excelled in the world, and "the Cape Ann make" has justly obtained a world-wide reputation for superior excellence. The peculiar cut for the oil-cloth garments which originated in Gloucester, Mass., has received the unqualified approval of all seamen familiar with it, and has been copied extensively both in the United States and in foreign countries. No class of seamen are so comfortably clothed as are the New England fishermen, though less regard is paid to apparel by those engaged in fishing in milder latitudes.

FOOD, MEDICINE, AND SHELTER.

Probably no class of seamen are so well provided for in the matter of food as are the crews of New England fishing vessels. Of course, in making this statement exceptions may be made of the officers of steamers and sailing ships, though it is by no means the case that the latter are always better provided for than the fishermen. As a matter of fact it is extremely probable that the average fishermen is better fed than the average officer in the merchant marine. The cook on a fishing schooner is, with the single exception of the captain, the best paid man on board, and often is given a "lay" that makes his remuneration quite equal to that of the skipper. He is therefore expected to be a skillful cook and a generally capable and reliable man; and to him is usually intrusted the responsible duty of naming the quantity of the provisions which he selects and takes on board for any given cruise.

All the members of a schooner's crew, from the captain to the smallest boy (if any boys are carried), eat at the same table, and fare precisely alike. Almost without exception the cook decides what he shall prepare for each meal, and if he be well qualified for his work the dishes are sufficiently numerous and varied to suit any but the most fastidious appetite.

Salt or corned meats are carried, though most vessels on leaving port take more or less fresh meat, and some which are engaged in market fishing have more fresh meat than any other. Hard bread is rarely or never used, except to make puddings; the "soft tack" made on the fishing-vessels often equals in excellence the best bread that can be obtained on shore. Canned milk, eggs, fruit, and other delicacies are often carried.

All of the first-class fishing-vessels are provided with a medicine-chest. The one exhibited is about a fair average.

The collection of photographs of fishermen's dwellings represents the style of houses generally occupied by this class. Whether in town or along the coast the cottages are of wood, substantially built, and are generally furnished in a comfortable manner.

FISHERMEN'S LOG-BOOKS.

While the bounty law was in force it was part of the duty of a fishing skipper to keep a log of the movements of the vessel, the amount of fish taken, the grounds visited, &c. These were, however, generally very unsatisfactory, so far as giving any information is concerned.

Of late years some of the more intelligent fishermen of New England have kept log-books or journals of their trips at the request of Prof. Spencer F. Baird, United States Fish Commissioner, who wished to obtain extensive notes of this kind for assistance in his study of the American fisheries. Many of these logs contain a vast deal of interesting information which throws much light on the movements of fishes, the methods of fishing, &c.

FISHERMEN'S WIDOWS AND ORPHANS AID SOCIETIES.

In most, if not all, of the smaller fishing ports of the United States there have been no regularly organized societies for the aid of the families of fishermen lost at sea. The men sailing from those ports have not, as a rule, engaged very extensively in the winter fisheries, and consequently the loss of life has been comparatively small. There has not, therefore, seemingly been the same urgent need of relief societies in the small communities (where the few needy families of lost fishermen could be cared for to a greater or less extent by their more fortunate neighbors) as there has been in the large fishing port of Gloucester, Mass., from which the fisheries are pursued at all seasons, and where the sacrifice of life has often been tremendous within the past thirty to forty years. The result of such fearful loss of life as often occurs, when, as sometimes happens, 100 men or more go down in a single gale, is to leave many families deprived of their natural protectors—the hardy and daring fishermen who man the fleets of New England. As a matter of course the widows are frequently left with large families of young children, and entirely without the means of subsistence, while the care that must necessarily be given to those dependent on them deprives them of the opportunity to engage in any employment. In other cases when the widows of lost fishermen can and would gladly work they are often unable to find employment in the towns where they reside, and the struggle for life often becomes a very disheartening one. When the losses from Gloucester were of comparatively rare occurrence the necessity for aid societies was not so apparent as at the present time when it is not an unusual thing for more than 200 men to be lost in a single year. The suffering which this terrible loss has caused on specially fatal occasions has led to the formation of several aid societies, some of them of brief duration, being organized only for the emergency which called them into existence, while others have continued since

their organization, carrying on their good work with greater or less activity according to the demands made upon them.

The most permanent of these are the Gloucester Fishermen's and Seamen's Widows and Orphans Aid Society, and the Gloucester Female Charitable Association.

The Gloucester Fishermen's and Seamen's Widows and Orphans Aid Society was first organized in March, 1862, and since that time the yearly collections have been as follows: 1862, $18,544; 1863, $155; 1864, $7,500; 1865, $4,601; 1866, $4,913; 1867, $3,546; 1868, $4,556; 1869, $4,897; 1870, $4,420; 1871, $4,020; 1872, $4,220; 1873, $5,485; 1874, $5,192; 1875, $5,120; 1876, $4,605; 1877, $4,860; 1878, $3,252; 1879, $18,559; 1880, $3,550; 1881, $3,900.

Total receipts to 1881	$115,895
Funds held by society (invested) at close of the season, 1881	20,500
Total expenditure in nineteen years	95,395

The amount raised in 1862 was by public subscription. The following year the society tried to raise money from the fishermen by issuing to them for the sum of $1 each certificates which entitled their families to receive benefit in case the one paying for the certificate should be lost. This scheme did not work well. The fishermen were superstitious about buying the certificates, and consequently only about 150 of them were sold. The following year a percentage was charged, and the same system, with slight modifications, has continued till the present time.

One-half of 1 per cent. is now deducted from the earnings of each fisherman that sails in the Gloucester vessels, and it is from this source that the society now derives its income, with the exception of contributions, which are often of considerable magnitude. The total amount collected from the fishermen by the firms is turned in at the end of each season.

The large collections made in 1879 were received chiefly from outside sources. The various relief societies that sprang up in that calamitous time collected about $30,000, most of which has since that year been disbursed among the needy, the balance being invested and kept as a reserve fund wherewith to meet any future exigency that may arise.

An attempt was made in 1865 to induce the fishermen to become life members by the payment of $10 each, but this project did not meet with any greater favor than did the scheme for selling certificates.

The following extract from the preface to the record-book of the society gives a detailed history of its inception, the causes which led to its organization, and subsequent changes in its methods of working:

"In January, 186-, and in February, 1862, in consequence of severe gales at sea, a great calamity fell upon the town of Gloucester. In January four vessels were lost, and in February (24th and 25th) sixteen more

were lost, most of them with their entire crews. It involved a loss of twenty vessels and one hundred and forty men, and in property about $100,000, leaving seventy-five widows and one hundred and sixty fatherless children needing help. It cast a gloom on the whole community, and a public meeting of the citizens was called at the town hall on the evening of March 20, 1862, to devise some means to obtain help for those who were so suddenly made destitute. At this meeting a committee of seventeen citizens was appointed to take the whole subject in charge, and they had circulars printed stating the facts in the case and asking help. These circulars were sent to the various cities and towns in the State, as well as to other large cities and towns, and a subcommittee was appointed to solicit subscriptions. The call for aid was satisfactorily and most nobly responded to; a large sum of money was received (see record-book of old society and treasurer's account), and the committee have from that time until the present (April, 1865) attended to the distribution of the funds that were received.

"Considering the very hazardous nature of the fishing business of the town, it was thought by the committee that the old organization should be dissolved, and a new society be incorporated similar in character to the old, and formed on a permanent basis. Therefore, a notice, under date of March 8, 1865, was published in the newspapers of the town, calling upon the citizens to meet at the [office of the] Gloucester Mutual Fishing Insurance Company to take into consideration the expediency of permanently organizing a society for the relief of the widows and orphans of fishermen and seamen, and to perfect such organization if deemed necessary." (See newspapers of the day.)

Agreeably to the notice a meeting was held. J. W. Lowe was chosen chairman and Joseph O. Proctor, secretary. B. H. Corliss, in behalf of a committee previously appointed for the purpose of drafting a constitution, reported a preamble and constitution (which is attached), which was adopted by the meeting, each article having been acted upon separately; and after appointing a committee, consisting of B. H. Corliss, Sylvester Cunningham, Joseph O. Proctor, and Fitz E. Riggs, to report a list of officers for the society, the meeting adjourned to the following (Tuesday) evening, at 7½ o'clock. On Tuesday evening, March 9, the citizens again met, as per adjournment, and the committee reported a board of fifteen directors to the meeting, viz: George Garland, Epes W. Merchant, Joseph O. Proctor, B. H. Corliss, Addison Gilbert, William O. Pew, Charles Parkhurst, Peter Sinclair, Gorham P. Leon, James W. Patillo, Fitz E. Riggs, Charles H. Pew, William Parsons 2d, William T. Merchant, Sylvester Cunningham. These were all elected by ballot. It was then voted that 500 copies of the constitution be printed; and the meeting adjourned *sine die*, after voting to raise funds by collecting 0.25 per cent. of the proceeds of the fishing voyages, and to collect outside the fishing interest $1,000, if possible.

"*Thursday, March* 16, 1865.—At a meeting of the directors this day

the following officers were chosen by written ballot for the present year: Benjamin H. Corliss, president; George Garland, vice-president; Joseph O. Proctor, treasurer; Addison Gilbert, secretary."

The "Gloucester Female Charitable Association" was incorporated January 22, 1872. It now has a membership of thirty-four ladies, who are assessed $1 each per annum. This society has at the present time a fund of $3,500, $1,500 of this being a bequest, of which only the interest can be used, while the remainder is subject to the action of the society.

This organization is not for the exclusive purpose of relieving the needy relatives of fishermen and seamen, but "for the deserving poor of Gloucester." It is scarcely necessary to say that nearly all of the "deserving poor of Gloucester" are such as have been left destitute by the loss of their natural protectors.

B.—FISHING CRAFT.

VESSELS.

RIGGED MODELS OF VARIOUS TYPES OF VESSELS IN THE FISHERIES, PAST AND PRESENT.

1. FISHING STEAMERS.

MENHADEN FISHING STEAMER.

Model, scale ½ inch to foot. Single-screw propeller; sharp bow; low, flat floor; shallow keel; lean run; round stem; moderate sheer; sloop-rigged, carrying mainsail and jib (jib triced up on the stay, mainsail brailed up to gaff and mast). Pilot-house and captain's cabin on deck forward; large main-hatch amidships; engine-house, &c., aft. Carries two seine-boats at quarter davits. Boston, Mass., 1883. 76,012. U. S. Fish Commission. This model represents the steamer Jemima Boomer, of Tiverton, R. I., one of the finest vessels employed in the menhaden fisheries. She carries a large cargo, and it is claimed that she will make a speed of 9 to 10 knots, even when deeply loaded. About 70 of these steamers are employed in the menhaden fishery, and their catches vary from 10,000 to 60,000 barrels of fish each season. This fishery is carried on near the land and in comparatively smooth water. *Dimensions of original:* Length over all, 110 feet; beam, 17 feet; depth, 7½ feet; draught of water, bow 3 feet, aft 7½ feet; mast, above deck, 54 feet; gaff, 21 feet; mast, 38 feet aft of stem.

GILL-NET STEAMER.

Model, scale ½ inch to foot. Propeller; one mast, rigged with stationary gaff for hoisting or for sail; sharp bow and bilge; round stern; engine and wheel houses. 55,812. U. S. Fish Commission. This model represents the class of small steamers employed in the gill-net fisheries of the Great Lakes. They vary in size from 10 to 40 tons. The nets are set over the stern and drawn in over the bow. The fish are stowed in bins and ice-boxes in forward hold. *Dimensions of original.*—Hull: Length, 61 feet; beam, 11½ feet. Smoke-stack, 12 feet above rail; diameter of screw, 4½ feet. Spars: Mast, 34 feet; gaff, 15½ feet.

2. FISHING KETCHES.

FISHING KETCH.

Model, scale ½ inch to foot. This model represents a ketch such as were employed in the American fisheries during the early

FISHING KETCH—Continued.

history of the country and previous to the invention of the schooner, which came into use in the early part of the eighteenth century. 57,014. Capt. H. C. Chester. Full, bluff bow; curved stem, with projecting billet-head; low, full bilge; short, full run; full, rounding stern, having a projection above deck extending aft of rudder-head, like the "pink" (so called) of the pinkey; curved stern-post; slight sheer. The rig consists of two masts and an adjustable bowsprit. The mainmast is placed in the center of the vessel, and the mizzen half-way between mainmast and stern. The sails are a jib and two staysails forward, topsail, topgallant-sail, and spencer on mainmast, and topsail and spanker on mizzen-mast. *Dimensions of full-sized ketch.*—Hull: Length over all, 55 feet; beam, 15 feet; draught, 8 feet. Spars: Length, bowsprit (outside stem), 20 feet; mainmast (above deck), 30 feet; main-topmast, 19½ feet; main-topgallant mast, 14 feet; mizzen-mast (above deck), 24 feet; mizzen-top-mast, 18 feet; spanker-boom, 16 feet; spanker-gaff, 12 feet.

3. FISHING SCHOONERS.

STANDING-ROOM CHEBACCO BOAT "LION."

Model, scale ½ inch to foot. This model represents a pink (or sharp) stern, standing-room chebacco boat of about 10 tons, the smallest class used in the period between 1780 and 1820. She has full, round bow; narrow beam; sharp stern; three standing rooms, where the men stood to fish; two hatchways; no bowsprit; two masts, the foremast well forward. Gloucester, Mass. 39,198. Designed by Capt. Stephen J. Martin. The class of small vessels represented by this model were extensively used by the New England fishermen in the latter part of the eighteenth century, and were often built by the fishermen who sailed them. *Dimensions of original.*—Hull: Length over all, 34 feet; beam, 9½ feet; depth of hold, 4½ feet. Spars: Foremast (above deck), 23 feet; mainmast, 23½ feet; foreboom, 12 feet; main-boom, 18½ feet.

"DOGBODY" OR SQUARE-STERN CHEBACCO BOAT "CHEBACCO."

Model, scale ½ inch to foot. This model represents a square stern, decked, chebacco boat of about 17 tons; this, together with pinkey boats of the same rig, and which were also decked, being the best class of these crafts employed in the fisheries during the early part of the present century. It has very full, rounding bow; straight side; square stern; low, round bilge; short run; raised "cuddy" deck forward; high stem; no bowsprit; two masts; two sails, foresail and mainsail; two fishkids;

"DOGBODY" OR SQUARE-STERN CHEBACCO BOAT "CHEBACCO"—Cont'd.

cables, anchors, and fishing rails. Gloucester, Mass., 1883. 57,587. U. S. Fish Commission. These peculiar fishing vessels, which were extensively used in the shore cod and mackerel fisheries during the last century and the beginning of this, derived their specific name from the place where they were built —a part of the present town of Essex, Mass., then known as Chebacco. At the present time they have entirely disappeared from the fishing fleet. *Dimensions of original.*—Hull: Length over all, 36 feet; beam, 11½ feet; draught, 6 feet. Spars: Foremast (above deck), 28 feet; mainmast (above deck), 30 feet; foreboom, 16 feet; foregaff, 14 feet; mainboom, 20 feet; maingaff, 13 feet.

PINKEY "PORPOISE."

Model, scale ½ inch to foot. This model represents a pinkey of about 35 to 40 tons, such as were built in the period between 1820 and 1840. Full, rounding bow; stem very much curved; straight side; low, round bilge; short, full run; sharp stern, surmounted by a "pink"; straight, slanting stern-post; narrow rudder, with square heel; old style windlass, cables, anchors; raised "cuddy" deck forward; chimney-funnel; boat; two fish-kids; two masts, bowsprit, top-mast, and three sails (mainsail, foresail, and jib). Gloucester, Mass., 1883. 57,586. U. S. Fish Commission. The class of vessels represented by this model succeeded the chebacco boats, from which they differed only in being, as a rule, larger, and carrying a bowsprit and jib. Pinkeys were extensively used in the general sea fisheries, being employed on the distant banks and in the waters of the Gulf of Saint Lawrence, as well as off the coast of the United States. Few have been built since 1840, and vessels of this class are now rarely seen in the fishing fleet. *Dimensions of original.*—Hull: Length on deck, knight-heads to stern-post, 45 feet; beam, 14 feet; draught, 8½ feet. Spars: Bowsprit (outside knight-heads), 14 feet; foremast (above deck), 34 feet; mainmast (above deck), 38 feet; main-topmast, 13½ feet; foreboom, 19 feet; mainboom, 30 feet.

OYSTER BUCKEYE.

Model, scale 1 inch to foot. Schooner-rigged, with mainsail, foresail, jib, maingaff-topsail, and staysail (the latter not set); sharp bow and stern; fine entrance and counter lines; moderate length of run; flat floors. Usually carries center-board. Fitted with two oyster rake-dredges, winches, &c. 55,807. U. S. Fish Commission. Vessels of this description are largely used in the oyster fisheries of Chesapeake Bay. They vary in size from 10

OYSTER BUCKEYE—Continued.

to 20 tons; are good sea-boats and fast sailers. *Dimensions of original.*—Length over all, 36 feet; keel, 33 feet; beam, 7½ feet; depth of hold, 4 feet; mainmast from partners, 25 feet; main-topmast, 10½ feet; foremast, 25 feet; bowsprit, 9½ feet; main-gaff, 10 feet; mainboom, 18 feet; foregaff, 9 feet; foreboom, 18 feet.

OYSTER PUNGY.

Model, scale 1 inch to foot. Schooner-rigged, with all sails (main-sail, foresail, jib, staysail, and gaff-topsail) set; sharp aft; moderately sharp, rounding bow; low bilge; rather flat floor. Fitted with oyster-rakes, winches, &c. Baltimore, Md., 1880. 42,757. T. B. Ferguson. The style of small schooners represented by this model is employed to some extent in the oyster fisheries of the Chesapeake Bay and its tributaries. *Dimensions of original.*—Hull: Length over all, 48 feet; keel, 42 feet; beam, 12 feet. Spars: Bowsprit (outside), 13½ feet; foremast (above deck), 38½ feet; mainmast, 38½ feet; main-topmast, 7½ feet; mainboom, 25 feet; outboard, 7 feet.

OLD-STYLE GRAND BANK COD-FISHING SCHOONER "OPEN SEA."

Model, scale ½ inch to foot. This is the model of the schooner Open Sea, of Marblehead, built about 1820, and represents a vessel of about 75 to 80 tons, old measurement (55 to 60 tons new measurement), such as were employed in the fisheries in the period between 1750 and 1840. Full, round bow, curved stem, and gammon-knee cutwater; long, straight side; long floor; low, full, round bilge; short, full run; large, square stern; high quarter-deck, extending nearly to mainmast; old-style windlass (worked with hand-spikes), cables, anchors; 4 fish-kids (2 on each side) on main deck; scaffold crutch for foreboom; steps on each side of quarter-deck; two pumps; square-stern yawl-boat, turned bottom up and lashed on top of davits. Gloucester, Mass., 1883. 57,585. U. S. Fish Commission. The class of vessels represented by this model were extensively employed in the Grand Bank cod-fishery during the last century, and to a less extent during the first quarter of this. Many of them had higher and shorter quarter-decks than this model, and were known as heel-tappers. In all cases the crew fished with hand-lines from the deck. *Dimensions of original.*—Hull: Length over all, 65 feet; beam, 18 feet; draught, 8 feet. Spars: Bowsprit (outside knight-heads), 15½ feet; foremast (above deck), 43½ feet; mainmast (above deck), 45½ feet; main-topmast, 21½ feet; foreboom, 22 feet; foregaff, 21 feet; mainboom, 38 feet; maingaff, 24 feet.

FISHING SCHOONER.

Model, scale $\frac{3}{8}$ inch to foot. Moderately sharp, rounding bow; broad beam; deep bilge; square stern. Spars, standing and running rigging complete. No sails bent. Gloucester, Mass., 1876. 25,731. Capt. H. C. Chester. Type of vessel used in New England fisheries; period, 1850 to 1860. *Dimensions of original.*—Hull: Length over all, $66\frac{1}{3}$ feet; beam, $21\frac{1}{2}$ feet. Spars: Bowsprit, $16\frac{2}{3}$ feet; jib-boom, $13\frac{1}{3}$ feet; foremast (above deck), 62 feet; mainmast (above deck), 63 feet; main-topmast, 31 feet; mainboom, 46 feet.

OYSTER SCHOONER "J. L. CARROLL."

Model, scale 1 inch to foot. Moderately sharp, rounding bow, long cut-water, and very slanting stem; broad beam; high bilge, with much dead rise; long run; square stern; decked; cabin aft. Equipped with oyster-dredges, winches, &c. Spars, standing and running rigging, and sails complete. Baltimore, Md., 1876. 26,536. T. B. Ferguson. This model represents the class of vessels most extensively employed in the oyster fisheries of the Chesapeake and its tributaries. They vary in size from about 15 to 45 tons, are all schooner-rigged, with main-topmast, but rarely carry flying-jib. They are good sailers and "handy." *Dimensions of original.*—Hull: Length over all, $47\frac{1}{4}$ feet; keel, 36 feet; beam, 15 feet. Spars: Bowsprit (outside knight-heads), 16 feet; foremast (above deck), $44\frac{1}{2}$ feet; mainmast (above deck), 45 feet; main-topmast, 18 feet; main-boom, 26 feet; outboard, 9 feet.

SCHOONER-SMACK "STORM KING."

Model, about $\frac{3}{4}$ inch to foot. Sharp bow; flush deck; long, clean run; square stern. Well amidships for keeping fish, lobsters, &c., alive, the bottom of this portion of the vessel being perforated for the purpose of allowing a free circulation of water in the well. Rigged complete, with sails (mainsail, foresail, and jib) set. Boston, Mass., 1876. 26,584. Johnson & Young. This model represents the class of small schooners employed in transporting lobsters from the fishing grounds to the various markets. They vary in size from 20 to 50 tons. *Dimensions of original.*—Hull: Length over all, $53\frac{1}{3}$ feet; beam, $15\frac{2}{3}$ feet; depth of hold, $7\frac{1}{3}$ feet; draught of water, $7\frac{1}{2}$ feet. Spars: Bowsprit (outside), $14\frac{2}{3}$ feet; foremast (above deck), 47 feet; mainmast (above deck), $47\frac{1}{2}$ feet; main-topmast, 16 feet; foreboom, $14\frac{2}{3}$ feet; mainboom, $38\frac{3}{4}$ feet.

GEORGE'S BANK COD-FISHING SCHOONER "JAMES A. GARFIELD."

Model, scale $\frac{1}{2}$ inch to foot. This model represents a clipper schooner of about 70 tons register, in ordinary rig, such as

GEORGE'S BANK COD-FISHING SCHOONER "JAS. A. GARFIELD"—Cont'd.

many of this class carry all the year, though in winter some vessels have no main-topmast. All sails (mainsail, foresail, jib, main-staysail, and gaff-topsail) are set, and the riding-sail lashed to davit-plank, as is usually the case when these vessels are making a passage to or from the banks. Gloucester, Mass., 1883. 56,938. U. S. Fish Commission. This class of vessels employed in George's Bank cod-fishing, fitted with gurry-pens on deck, fishing-rails, stern dory, &c. *Dimensions of original.*—Hull: Length over all, 84 feet; beam, 21½ feet; depth of hold, 8 feet. Spars: Bowsprit (outside knight-heads), 19 feet; foremast (above deck), 60 feet; mainmast, 60½ feet; main-topmast, 33 feet; foreboom, 23½ feet; mainboom, 60 feet.

GRAND BANK FISHING SCHOONER "SPENCER F. BAIRD."

Model, scale ½ inch to foot. Model represents a clipper schooner of 80 to 85 tons, with mainsail, foresail, jib, flying-jib, staysail, and gaff-topsail set; riding-sail lashed on davit-plank, and dories inverted and lashed on checker-planks, as they usually are when the vessel is making a passage to or from the banks. Gloucester, Mass., 1883. 56,939. U. S. Fish Commission. The equipment, as well as the style of schooners commonly employed in the Grand Bank cod and halibut trawl-fisheries, represented by this model. *Dimensions of original.*—Hull: Length over all, 86 feet; beam, 22½ feet; depth of hold, 8¼ feet. Spars: Bowsprit (outside knight-heads), 19 feet; jibboom (outside cap), 12⅔ feet; foremast (above deck), 64 feet; mainmast (above deck), 65 feet; main-topmast, 36 feet; mainboom, 62 feet; foreboom, 25 feet.

MARKET SCHOONER "MARY ODELL."

Model, scale ½ inch to foot. Long, sharp bow; broad beam; slightly hollow floor; long, sharp run; elliptical stern; rigged complete with all sails (mainsail, foresail, jib, flying-jib, staysail, and gaff-topsail) set. Gloucester, Mass., 1880. 39,337. U. S. Fish Commission. This model represents a class of vessels employed in the mackerel fishery in summer, and in the cod and haddock fisheries in winter, carrying their fish, as a rule, to market in a fresh condition. These schooners vary from 35 to 75 tons, and are specially designed for speed and ability to carry a large amount of canvas. *Dimensions of original.*—Hull: Length over all, 61 feet; beam, 18 feet; draught, 9 feet. Spars: Bowsprit (outside), 15 feet; jibboom (outside cap), 10 feet; foremast, 52 feet; mainmast, 52½ feet; main-topmast, 25½ feet; foreboom, 19½ feet; mainboom, 47 feet.

MACKEREL-FISHING SCHOONER "WILLIAM M. GAFFNEY."

Model, scale ½ inch to foot. This model represents a clipper schooner of about 75 tons, with all sails (mainsail, foresail, jib, flying-jib, jib-topsail, or balloon jib, main staysail, fore and main gaff-topsails) set; the rig is that of a double-topmast schooner; long, sharpbow; broad beam; long run; elliptical stern. Gloucester, Mass., 1880. 39,487. U. S. Fish Commission. The equipment, rig, and other characteristics of the extreme clipper schooners employed in the mackerel purse-seine fishery are represented by this model. *Dimensions of original.*—Hull: Length over all, 82 feet; beam, 21 feet; depth of hold, 7¾ feet. Spars: Bowsprit (outside knight-heads), 18 feet; jibboom (outside cap), 12 feet; foremast and fore-topmast (above deck), 84 feet; mainmast and main-topmast (above deck), 85 feet; mainboom, 56 feet.

FISHING SCHOONER "GERTIE EVELYN," OF GLOUCESTER, MASS.

Sectional model, port side, scale 1 inch to foot. This model shows the exterior and interior of the port side of a clipper fishing schooner, such as are now employed in the general deep-sea fisheries of New England. It is specially designed to show the arrangement of the interior, such as the forecastle, cook's pantry and store-room, ice-houses for the refrigeration of fish, bait, &c., the stowage of ballast, cabin, gear-room, &c. The ice-house is built in the style which has been most commonly adopted on vessels employed in the fresh-halibut fishery or the winter haddock fishery, and with the exception that on some of the vessels the ice-house is divided into two sections—the "forward" and "after" ice-houses—by a bulkhead just abaft the mainmast, few if any differ from this. Comparatively few American schooners carry any other than stone ballast, and such is shown, though some have partly iron ballast, which is stowed each side of the keelson, and in exceptional cases a vessel may be wholly ballasted with iron, especially those of smaller size. The forecastle, which is the sleeping apartment for a portion of the crew and for the cook, and the place where the cooking is done, and where the entire crew, including the captain, eat their meals, is finished in pine, painted and grained. Lockers run around both sides, and serve the double purpose of seats for the men and stowage for vegetables. The cooking-stove sits on a platform, raised about 4 to 6 inches above the floor, at the after end of the forecastle on the starboard side. There are three lengths of sleeping berths (five berths only of which are usually occupied) on the port side, and two lengths on the starboard side, though it rarely happens that they are all filled. Besides these there are two more berths on the starboard side, aft of the "dish-closet" (which is at the

FISHING SCHOONER "GERTIE EVELYN," GLOUCESTER, MASS.—Cont'd.

side about abreast of the foremast), that are used by the cook for the storage of small stores and other material which he uses. At the after end of the forecastle, on the port side, is a small upright closet with shelves where the cook keeps a supply of eatables, which the fishermen have access to at all hours of the day and night; this is called the "grub-locker." Near this is the door leading into the forehold, where is the cook's pantry on the port side, and the coal-pen on the starboard side, where also is stowed a supply of wood, flour, beef, pork, &c. Beneath the floor of the pantry, at least in part, are the water-casks, each holding about 250 gallons, these being supplemented by a greater or less number of barrels filled with water, which are also stowed in the forehold. In the pantry the cook prepares the food for cooking, and this apartment is often painted in a neat and tasty manner. The ice-house is separated from the pantry by a double bulkhead of matched boards with tarred paper between. The platform of the ice-house is usually made of spruce or pine planks 2 inches in thickness; these being laid on cross-pieces of 3 x 4 joists, which are fitted in their proper places, well secured, and also supported in the middle before the ballast is put on board. The platform is held securely in place by the stanchions which form the frame-work of the pens or sections into which the ice-house is divided. Each pen is separated from the next by a single partition of one-inch boards. A portion of the front of each side pen is tightly closed up from the floor to the deck, while the remainder is adjustable, a number of "pen-boards" being cut of suitable lengths so that by sliding in grooves in the upright stanchions they may be put in or removed as occasion demands. The pens on the sides are called "wing-pens," while those in the center aisle are known as "slaughter-house pens," the one, however, which is directly under either the main or after hatch having the name of "slaughter-house." The cabin is finished with hard wood, usually black walnut and ash; it has four berths, the forward one of which on the starboard side is occupied by the captain, while the others are taken by such members of the crew as may secure them by lot, since there are no under officers to claim them by right. Beneath the cabin floor, in which there is a small trap-door, a supply of coal for the cabin stove is carried. Aft of the cabin, in the extreme stern, is a rough, unfinished apartment, where such materials as spare fishing-gear, light sails, cordage, blocks, &c., are stowed. The larger mass of fishing-gear, which is very bulky, is stowed in the ice-house when the vessel is making passages. The particular schooner which

FISHING SCHOONER "GERTIE EVELYN," GLOUCESTER, MASS.—Cont'd.

this model represents was built by Mr. John Bishop, of Gloucester, Mass., and launched in February, 1883. She has been employed in the winter haddock fishery, carrying her catch fresh to market, a distance varying from 150 to 300 miles. She is about 82 tons register (135 tons builder's measure), and has made, in the few months she has been running, a good record for speed and sea-worthiness. She is from 4 to 6 inches deeper than the average American fishing schooner of the same size, has fine lines, with long, sharp bow, which is slightly concave beneath the water line; moderately full bilge; broad beam; long, finely-cut run; rather full, elliptical stern, which has considerable overhang. The relative dimensions of spars, sails, and rigging for this class of vessel is shown on the full-rigged models. Gloucester, Mass., 1883. U. S. Fish Commission. 76,011. *Dimensions of original:* Length over all, 87 feet; keel, 82 feet; (total length of model, including stub bowsprit, 96 inches). Beam (extreme), 22½ feet. Depth of hold, 8⅓ feet. Draught, aft 9½ feet, forward 5¼ feet. Depth of keel, 22 inches. Extreme length of forecastle, 22 feet; of pantry or forehold, 7½ feet; ice-house, 28¼ feet; cabin (on floor), 10 feet; house (outside), 11¾ feet. Height: Forecastle and cabin, about 6 feet under beams; forehold, 6 feet; ice-house, extreme 6 feet, average 5 feet.

Names of the several sections of the model.

1. Upper forepeak berth.
2. Lower forepeak berth, generally used only for the stowage of lanterns, oil-cans, &c.
3. Table. This is divided into two sections, the after one of which turns back, folding around and fastening to the foremast when not in use.
4. Forecastle floor.
5. Locker.
6. Foremast.
7. Pawl bit.
8. Heel of bowsprit.
9. Windlass.
10. Traveler. The lower jib-sheet block is fastened to an iron ring which runs on this traveler.
11. Upper middle berth, port side. The berth corresponding to this on the starboard side is always occupied by the cook.
12. Lower middle berth, port side.
13. Upper after berth. The berth corresponding to this on starboard side not so wide, and used only for storage of small stores, &c., as is the one next below it.

FISHING SCHOONER "GERTIE EVELYN," GLOUCESTER, MASS.—Cont'd.

14. Lower after berth, sometimes called "slaughter-house" berth, because of its exposure to cold drafts of air in the winter from the forehold and companion-way.
15. "Grub-closet."
16. Entrance to forehold.
17. Steps.
18. Water-cask.
19. Pantry floor.
20. Flour barrel.
21. Beef barrel.
22. Cook's bread-board.
23. Shelves for boxes, firkins, &c.
24. Ice-house bulkhead.
25. Ice-house floor.
26. Shifting planks. These are rough planks, running fore and aft between the stanchions, to prevent the ballast from shifting to either side in case the vessel should be knocked on her beam ends.
27. Ballast. The kind of ballast usually carried and the method of storage is seen beneath the glass. The ballast extends the entire length of the ice-house.
28. Forward slaughter-house.
29. After slaughter-house.
30. Forward wing-pen, port side.
32. Wing-pen, port side, next to forward one.
33. Third wing-pen, port side.
34. Fourth wing-pen, port side.
35. Wing-pen, port side, next to after one.
36. After wing-pen, port side. This is often filled with salt, which is carried for the double purpose of curing any codfish which may be taken, and also for salting the fishing-gear when not in use.
37. After midship-pen.
38. "Hospital"-pen. This is the pen amidships which incloses the mainmast and pumps, and is so called because it is difficult to ice halibut properly in it; sometimes called the mainmast-pen.
39. Slaughter-house pen.
40. Mainmast.
41. Pumps.
42. Forecastle companion-way.
43. Fore hatch.
44. Main hatch.
45. Quarter-deck break.
46. After hatch.
47. House.
48. Skylight.
49. Funnel-cap.

FISHING SCHOONER "GERTIE EVELYN," GLOUCESTER, MASS.—Cont'd.

50. Cabin companion-way.
51. Steps.
52. Locker-seats.
53. Binnacle.
54. Stove.
55. After berth, port side.
56. Forward berth, port side. As a rule two men sleep in this berth. This is in all respects like the captain's berth, which is directly opposite.
57. Coal-locker.
58. Room for spare gear, &c.
59. Rudder.
60. Rudder-head.
61. Taffrail.
62. Knight-heads.
63. Keel.
64. Keelson.
65. Cutwater.
66. Stern.
67. Stern-post.

THREE-MASTED FISHING SCHOONER.

Model, scale ½ inch to foot. A full-rigged, clipper, three-masted schooner, with all sails set as when sailing in moderate winds; dories stowed on deck as is customary when making passages to or from the fishing grounds. Liver-butts (into which the codfish livers are put for the purpose of obtaining the oil) are stowed in chocks forward of the house. This vessel has fine lines, with moderately sharp bow; low and rather full bilge; long, clean run; slightly overhanging, elliptical stern; broad beam; long quarter-deck; and fine sheer. This schooner carries twelve sails, namely (beginning forward), jib-topsail, flying jib, jib, fore-staysail, foresail, fore gaff-topsail, main staysail, mainsail, main gaff-topsail, mizzen staysail, spanker, and mizzen gaff-topsail. In addition to these a three-cornered riding sail is carried, but this is used only when the vessel is on the bank; the riding sail is then bent to the mizzen-mast. This schooner carries twenty "single" dories, each of these being 13 feet long on the bottom. One man goes in each boat and fishes with handlines. In addition to the dories, which are always stowed on deck when not in use, a yawl boat is carried at the stern. This model represents a class of vessels recently introduced into the cod and mackerel fisheries of the United States, which are larger than those ordinarily employed. The Lizzie W. Matheson, of Provincetown, is 193 tons register, and has a capacity for 5,000 quintals or 560,000 pounds of codfish.

THREE-MASTED FISHING SCHOONER—Continued.

These schooners, being intended for the general coasting trade in winter, such as carrying oysters, fruit, &c., are built as a rule quite as much for carrying capacity as for speed, while in the construction of the typical fishing schooner the attainment of a high rate of speed is one of the most important considerations. *Dimensions of original.*—Hull: Length over all, 109 feet; keel, 96 feet; beam, 26 feet; depth of hold, 10 feet; draught of water, aft 11 feet, forward 8 feet; depth of keel (outside garboard), 20 inches. Spars: Length, foremast, above deck, 70¼ feet; mainmast, 72 feet; mizzen-mast, 73¼ feet; fore-topmast, 40 feet; main-topmast, 40 feet; mizzen-topmast, 40 feet; bowsprit (outside knight-heads), 22½ feet; jib-boom (outside cap), 19 feet; fore and main booms each, 23⅔ feet; fore and main gaffs each, 23½ feet; spanker-boom, 53¼ feet; spanker-gaff, 29¾ feet. Dimensions of yawl boat: Length over all, 17½ feet; beam, 5 feet; depth, 3 feet from gunwale to keel. Gloucester, Mass., 1883. Exhibited by Thomas A. Irving, of Gloucester.

BUILDERS' MODELS, SHOWING THE EVOLUTION OF THE NEW ENGLAND FISHING SCHOONER.

4. FISHING SCHOONERS.

PINK-STERN FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, rounding, high bow; low, rounding bilge; much drag-line and sheer; heavy draught of water; sharp stern with a raised "pink." *Dimensions of vessel:* Length over all, 52 feet; beam, 16 feet; depth of hold, 7 feet; draught of water, 8 feet aft and 5 feet forward. Essex, Mass., 1837. U. S. Fish Commission. 54,453. This is a model representing the pinkey July, built at Essex in the month of July, 1837. Pinkeys were used in the fisheries of the New England coast from 1815 to 1840, and a few old ones still survive at Gloucester and fishing ports in Eastern Maine. They are celebrated for their seaworthiness, and are good sailers.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, round bow; narrow beam; long, straight side; long, rounding, kettle bottom; very short run; square stern. *Dimensions of vessel:* Length over all, 60 feet; beam, 16 feet; draught of water aft, 8 feet 6 inches. Essex, Mass., 1835 to 1845. Gift of Jeremiah Burnham, builder. 54,449. This model was made about 1835, and was one of the first vessel models ever made at Essex. Previous to that period vessels were built by the eye without models. This class of vessels was fitted with gammon-knees, and the foot of the rudder was cut square.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, rounding bow; low bilge; long floor; rather full run; long, straight side; straight stern. *Dimensions of vessel:* Length over all, 78 feet; beam, 23 feet; draught of water aft, 10 feet. Essex, Mass., 1845. U. S. Fish Commission. 54,421. This is the model of the schooner Storm King, of Beverly, Mass., built at Essex in 1845. It is a style of vessel employed at that date in the Grand Bank cod-fishery, and is the form that followed the old-fashioned "heel-tapper."

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, rounding bow; narrow beam; long, straight side on top; low, deep bilge; medium length floor; full run of medium length; square stern. *Dimensions of vessel:* Length over all, 64 feet; beam, 16 feet; draught of water aft, 8 feet. Essex, Mass., 1845. U. S. Fish Commission. 54,427. The model represents the style of vessels employed in the Bank cod-fisheries from Beverly, Mass., in 1845. They had moderately sharp bows for the period, and were well designed for riding at anchor, and for sea-worthiness, though they were slow sailers.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, round bow; straight side; long, rounding bilge; short, full run; square stern. *Dimensions of vessel:* Length, 60 feet over all; beam, 17 feet; draught of water aft, 9 feet. Essex, Mass. Type, 1845 to 1850. U. S. Fish Commission. 54,457. This is the model of the schooner Susan Center, of Gloucester, built in 1847, and is the type of the round bow, square stern, and low quarter-deck vessels employed in the cod and mackerel fisheries from 1845 to 1850.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, rounding bow; medium bilge; short, but moderately lean run; rather broad beam; square stern. *Dimensions of vessel:* Length over all, 65 feet; beam, 18 feet; draught of water aft, 9 feet. Essex, Mass., 1845 to 1855. U. S. Fish Commission. 54,455. This model represents a class of vessels extensively employed in the cod and mackerel fisheries from 1845 to 1855. They were first termed clipper-built, but at a later date were known as half-sharp. They were built sharp to attain greater speed when employed in the mackerel fishery.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Rounding bow, with much flare; long, straight side; low, rounding bilge; long, but full run;

FISHING SCHOONER—Continued.

comparatively shoal forward; much drag-line; square stern. *Dimensions of vessel:* Length over all, 68 feet; extreme beam, 18 feet; draught of water aft, 8 feet. Essex, Mass. 1850. U. S. Fish Commission. 54,426. This model represents the style of vessel employed in the Grand Bank cod-fisheries from Beverly, Mass., in 1850. It was the type of vessel that succeeded the full-bow schooner, and was one of the first attempts at a sharp bow. At that period it was believed to be unsafe to build a vessel sharp forward with a flaring bow; they were round and full on the rail-line to prevent diving when at anchor or sailing by the wind.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Full, rounding, and flaring bow on top, sharpening rapidly toward the water's edge; long, straight sides; comparatively narrow beam; square stern; low bilge; short floor; long, but rather full run. *Dimensions of vessel:* Length, 66 feet over all; extreme beam, 18 feet; draught of water aft, 9 feet 6 inches. Essex, Mass. Type of 1845 to 1860. U. S. Fish Commission. 54,450. This is the model of the schooner Elisha Holmes, of Cape Cod, built at Essex in 1849 to engage in the cod and mackerel fisheries. It is the form of a class of vessels very much in use in the period from 1845 to 1860, and represents one type of the so-called sharp-shooters of that day. During the transition stage from full-bowed to sharp vessels, it was the opinion of many experts that it would be unsafe to build a vessel very sharp on the rail. It was thought that, with a full rounding bow on top and much flare below, a vessel would be prevented from plunging as deep in the water as she otherwise might do. Later developments have shown that this theory is a wrong one, and that a vessel with a flaring bow is not as good as one with straighter top timbers.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp bow; straight side; low, deep bilge; heavy draught of water; moderately sharp run; slight drag-line; more than average depth forward; square stern. *Dimensions of vessel:* Length over all, 68 feet; beam, 17 feet; draught of water aft, 9 feet. Essex, Mass., 1859. Gift of Willard R. Burnham, builder. 54,459. This is the model of the schooner We're Here, of Beverly, Mass., built at Essex in 1859, and employed in the Grand Bank cod-fishery. This style of vessel is especially adapted for the Grand Bank cod-fishery, being designed for safety and carrying capacity rather than speed.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Rather short, but moderately sharp, and slightly-flaring bow; low, full bilge; medium length of run; square stern with slight overhang. *Dimensions of vessel:* Length over all, 68 feet; beam, 19 feet 6 inches; draught of water aft, 9 feet. Essex, Mass. Type of 1855 to 1860. Gift of Charles O. Story, builder. 54,473. This is the model of the schooner Lookout, of Gloucester, built in 1857. Twenty or more fishing vessels were built from the same model prior to 1865, among them the E. K. Kane, Fish Hawk, Laughing Water, and Arizona. The last two vessels are still employed in the Gloucester fisheries. The vessels built from this model were very much liked as George's-men from 1855 to 1860. They were full-bodied and chunky vessels as compared with those built at the present time.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp, round, flaring bow; low bilge; rather short floor; long, lean run; square stern. *Dimensions of vessel:* Length over all, 69 feet; beam, 18 feet; draught of water aft, 8 feet 6 inches. Essex, Mass., 1855. U. S. Fish Commission. 54,422. This is the type of the sharp-bow vessels built in 1855, and employed in the mackerel and Grand Bank cod fisheries.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp bow; high bilge; long floor verging into a long, lean run; square stern. *Dimensions of vessel:* Length over all, 62 feet; beam, 19 feet; draught of water aft, 8 feet. Essex, Mass., 1850. U. S. Fish Commission. 54,466. This model was built from about 1850, and represents the style of vessels employed as market boats, making short trips and selling their catch in fresh condition. The necessities incident to the market fishery required swifter vessels than any other fishery; this model, therefore, is the type of the fast-sailers of 1850. As a rule, they had very deep keels and a good deal of drag-line. Their draught of water forward was less than half the draught aft.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp, rounding bow; high bilge; wide beam amidship, narrowing slightly toward the stern, which is elliptical; long, lean run; deep keel. *Dimensions of vessel:* Length over all, 58 feet; beam, 17 feet; draught of water aft, 8 feet. Essex, Mass., 1856. Gift of Joseph Story, builder. 54,435. This is the model of the schooner Ripple, built at Essex in 1853, and was the first vessel built

FISHING SCHOONER—Continued.

with an elliptical stern. The Ripple was engaged in the market fishery, and is somewhat different from the market vessel of 1850 in having a heavier draught of water and greater beam in comparison with her height.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp, rounding bow; short floor; long, lean run; more than average sheer; square stern, with very much overhang. *Dimensions of vessel:* Length over all, 73 feet; beam, 20 feet 6 inches; depth of hold, 6 feet 10 inches; draught of water aft, 9 feet 6 inches; length of keel, 56 feet 9 inches. Essex, Mass., 1859. U. S. Fish Commission. 54,471. This is the model of the schooner Break O'Day, of Gloucester, built at Essex in 1859. She was one of the first vessels built at that place with overhanging stern; was employed for a few years in the cod and mackerel fisheries; was captured at New Orleans while engaged in the fruit trade, and afterward used in blockade running.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp bow; high bilge; long, lean run; wide beam; elliptical, slightly overhanging stern. *Dimensions of vessel:* Length over all, 74 feet; beam, 21 feet; depth of hold, 7 feet; draught of water aft, 9 feet 6 inches. Essex, Mass., 1860. Gift of Jeremiah Burnham, builder. 54,470. This is the model of the schooner Flying Fish, of Gloucester, built at Essex in 1860. She was a fast sailer, and was employed for several years in the mackerel hook-fishery. She was afterwards engaged in the Antarctic fur-seal and sea-elephant fishery from New London, Conn.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Clipper-built, with sharp bow; long floor; long run, but not so lean as clipper vessels of more recent build; elliptical stern; broad beam; comparatively light draught of water. *Dimensions of vessel:* Length over all, 94 feet; beam, 23 feet; draught of water aft, 9 feet. Essex, Mass., 1857. Gift of Charles O. Story, builder. 54,448. This is the model of the schooners George Fogg and Etta G. Fogg, of Wellfleet, Mass., built at Essex in 1857. They were employed in the mackerel-fishery in the summer and oyster trade in the winter, and were the extreme clipper build of 1857, and far in advance of most of the vessels of that period. The oyster trade demanded fast sailers and vessels of shoal draught to permit their entering the bays and rivers to the oyster grounds.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp bow; full body; long run; elliptical, slightly overhanging stern. *Dimensions of vessel:* Length over all, 89 feet; beam, 22 feet 6 inches; depth of hold, 8 feet 3 inches; draught of water aft, 10 feet. Essex, Mass., 1863. U. S. Fish Commission. 54,474. This is the model of the schooner Galena, of Gloucester, built in 1863, employed for several years in the general fisheries, and sold to California; also model of the schooner Prince of Wales, of Gloucester, built in 1864, employed as a fishing vessel for several years, and sold to Surinam, South America. It is the style of large vessels still used in the general fisheries.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Long, sharp bow; broad beam; long floor verging into a long, lean run; elliptical stern. *Dimensions of vessel:* Length over all, 68 feet; beam, 18 feet; draught of water aft, 7 feet 6 inches. Essex, Mass., 1864. Gift of Joseph Story, builder. 54,440. This model was built from about 1864. It represents the extreme type of sharp vessels at that date, and in all essential particulars may still be rated as a fair model of the clipper schooner of to-day. The peculiarity of these vessels and of the more extreme clipper models of the present time is, that their run and floor are so molded as to form part of each other.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp bow; full body; long run; elliptical, slightly overhanging stern. *Dimensions of vessel:* Length over all, 72 feet; beam, 20 feet 9 inches; depth of hold, 7 feet 3 inches; length of keel, 62 feet; draught of water aft, 9 feet. Essex, Mass., 1867 to 1877. 54,456. This model represents the moderately sharp type of sea-going fishing vessels built from 1867 to 1877. More than thirty schooners have been made on this model; among them the Howard, built in 1874, and still engaged in fishing from Gloucester, the Carrie Louise, Cunard, Edward Grover, Aberdeen, and Nathaniel Webster. The Howard has been employed in the mackerel hook and seine fisheries, and the Bank cod and halibut fisheries, and was the only vessel of the Gloucester fleet that rode out the gale of December 10, 1876. The other vessels have been engaged in the various branches of the sea-fisheries, including the Greenland halibut-fishery.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Moderately sharp, high, rounding bow, somewhat fuller than the average; low, deep bilge;

FISHING SCHOONER—Continued.

medium length of run; much sheer; elliptical, and slightly overhanging stern. *Dimensions of vessel:* Length over all, 81 feet; beam, 24 feet; depth of hold, 8 feet; draught of water aft, 10 feet 6 inches. Essex, Mass., 1876. Gift of David Burnham, builder. 54,447. This is the model of the schooner Webster Sanborn, of Gloucester, 100 tons register, built at Essex in 1876, and lost at Newfoundland in the summer of 1882. She was employed in the Grand Bank cod and halibut fisheries. This type of vessel is specially designed for carrying capacity and seaworthiness and not for fast sailing. Many of the moderately fast schooners are better sailers than the extreme clippers, especially in rough weather.

FISHING SCHOONER.

Builder's model, scale $\frac{1}{2}$ inch to foot. Extreme clipper build, with long, straight bow; broad beam; high bilge; long, sharp run; broad, elliptical stern, with large overhang. *Dimensions of vessel:* Length over all, 56 feet; beam, 17 feet; draught of water aft, 7 feet; length of keel, 44 feet. Gloucester, Mass., 1880. Gift of John Bishop, builder. 54,454. This is the model of the schooners John M. Smart, of Portsmouth, N. H., and the Emma S. Osier, of Gloucester, Mass., employed in the market fishery. Vessels of this class are generally of small size, and employed on short trips, marketing their catch in fresh condition. They have very deep keels, and are designed for swift sailing, especially by the wind.

FISHING SCHOONER.

Builder's model, scale $\frac{1}{2}$ inch to foot. Extreme clipper type, with long, flaring bow; light draught forward; hollow floor; full sheer; elliptical, overhanging stern. *Dimensions of vessel:* Length over all, 106 feet; beam, 24 feet; draught of water aft, about 10 feet. Rockport, Mass., 1880. Gift of Capt. G. M. McClain. 54,419. This model was designed by Captain McClain, for a mackerel schooner of about 180 tons, carpenter's measurement. It is specially designed for speed and for use only during the summer season, and would not be suitable for winter fishing.

FISHING SCHOONER.

Builder's model, scale $\frac{1}{2}$ inch to foot. Extreme clipper build; long, sharp bow, with slightly concave water-lines; slightly hollow floor; long run; elliptical, overhanging stern; full sheer. *Dimensions of vessel:* Length over all, 87 feet; beam, 22 feet; depth of hold, 8 feet. Gloucester, Mass., 1879. Gift of Daniel

FISHING SCHOONER—Continued.

Poland, jr., builder. 54,444. This is the model of the schooner Ivanhoe, of Gloucester, built in 1879, and represents the extreme clipper type of vessels employed in the mackerel, winter haddock, and the halibut fisheries.

FISHING SCHOONER.

Builder's model, scale ½ inch to foot. Extreme clipper build, with long, sharp bow; broad beam; long, concave run; large sheer; circular stern, with large overhang. *Dimensions of vessel:* length over all, 100 feet; beam, 26 feet; depth, 9 feet 6 inches. Bath, Me., 1880. Gift of C. B. Harrington, builder. 54,462. This model represents the extreme clipper type of large schooners employed chiefly in the mackerel fishery.

MARKET-FISHING SCHOONER "NIMBUS."

Builder's model, scale ½ inch to foot. Painted; mounted in medallion; fully rigged, with spars, sails (mainsail, foresail, jib, main staysail, and main gaff-topsail) set, blocks and rigging on port side. Clipper model; long, sharp bow, slightly concave at water-line; long floor, merging into a long, clean, and finely cut run; elliptical, slightly overhanging stern; broad beam. Gloucester, Mass. 57,052. U. S. Fish Commission. This model represents the extreme clipper type of schooner employed in the market and George's Bank cod fisheries. The rig is that of a George's-man. The market-boats often carry jib-boom and fore-topmast in summer, with sails to correspond. *Dimensions of original*—Hull: Length over all, 74 feet; beam, 20 feet; draught aft, 8 feet. Spars: Bowsprit, 19 feet (outside); foremast (above deck), 60½ feet; mainmast (above deck), 61½ feet; main-topmast, 32 feet; mainboom, 54 feet; maingaff, 25 feet; foreboom, 23 feet; foregaff, 22½ feet.

IDEAL FISHING SCHOONER "NEW ERA."

Builder's model, scale ½ inch to foot. Starboard side of schooner; painted; mounted in medallion, and rigged with spars, sails, &c., complete. Clipper; long, sharp bow; deep body; more than average dead-rise; long, clean run; full, elliptical, overhanging stern, slanting upward from the lower center to the corner; fine sheer; long quarter-deck. Gloucester, Mass., 1883. 57,051. Designed by Capt. J. W. Collins. U. S. Fish Commission. This model represents a schooner of about 90 to 100 tons register, designed especially for the winter fisheries. A vessel built from it would be about two feet deeper than the typical American fishing schooner of the same length, and about one foot less beam. It would have less

IDEAL FISHING SCHOONER "NEW ERA"—Continued.

difference in draught between the bow and stern, that is, less drag-line. The rig differs from that of the American schooner in having a stem staysail and jib, instead of the large jib now universally used, and also in having shorter lower masts. In summer the rig might be changed by the addition of a fore-topmast and jib-boom with sails to correspond. It is believed that a vessel constructed on such a model would be safer in heavy gales, and much swifter, taking the chances as they come, than schooners of the ordinary type, which have much less body under water. The ballast can, of course, be placed lower, and thereby the leverage increased and the chances of capsizing diminished. *Dimensions of full size vessel.*—Hull: Length over all, 85 feet; keel, 69 feet; beam, 21½ feet; depth of hold, 10 feet; draught, aft 10½ feet, forward 8 feet. Spars: Bowsprit (outside), 20 feet; foremast (full length), 69 feet; mainmast, 70½ feet; main-topmast, 36 feet; mainboom, 58 feet (23 feet outside slings); foreboom, 25½ feet.

THREE-MASTED GRAND BANK COD-FISHING SCHOONER "LIZZIE W. MATHESON," OF PROVINCETOWN, MASS.

Builder's model, scale ½ inch to foot. Moderately sharp bow; straight side; good sheer; low, rounding bilge; long floor, with little dead-rise; rather short run; square, slightly overhanging stern. 193 tons register. Capacity for 5,000 quintals, or 560,000 pounds of codfish. *Dimensions of original:* Length over all, 105 feet; keel, 88 feet; beam, 24 feet; depth of hold, about 9 feet; draught of water aft, in ballast trim, 9¾ feet. Essex, Mass. Built by James & McKenzie. Model exhibited by Messrs. H. & S. Cook, Provincetown, Mass., the owners of the vessel.

BOATS.

MODELS OF ALL IMPORTANT TYPES OF BOATS AND FULL-SIZED BOATS USED IN THE FISHERIES OF THE UNITED STATES, INCLUDING PORTABLE AND FOLDING BOATS, DUG-OUTS, SKIN BOATS, BARK CANOES, ETC.

5. SLOOP, CUTTER, AND CAT-RIGGED, SQUARE-STERN BOATS.

MENHADEN CARRY-AWAY SLOOP.

Model, scale ½ inch to foot. Clipper-build; long; sharp bow; broad beam; light draught; center-board; wide, rather flat floor; fine run; square stern; decked, with large covered hatchway amidships (14 feet long, 8 feet wide); cabin aft. Greenport, N. Y., 1883. 57,029. U. S. Fish Commission. This model represents

MENHADEN CARRY-AWAY SLOOP—Continued.

the class of small yacht-like sloops employed in carrying menhaden from the "sail gangs" on the fishing ground to the factories of Long Island Sound. *Dimensions of original.*—Hull: Length (over all), 43½ feet; beam, 14 feet; draught of water aft (without center-board), 3½ feet. Spars: Mainmast (above deck), 45½ feet; bowsprit (outside), 15 feet; topmast, 22½ feet; mainboom, 44 feet; gaff, 21 feet. Skiff-boat attached (flat bottom, sharpy pattern), 11¾ feet long, 4 feet wide.

NOANK LOBSTER-BOAT.

Model, scale 1 inch to foot. Sloop-rigged; sharp bow; broad beam; wide, heart-shaped stern; fine lines; center-board; washboards; partly decked forward and aft. Open wells, for fish, with perforated bottom each side of center-board. Spars, standing and running rigging complete. No sails bent. Noank, Conn., 1876. 26,809. Presented by Capt. H. C. Chester. These boats are used chiefly in the lobster-fisheries of Long Island Sound, especially in the vicinity of Noank and New London, Conn. The well is for the purpose of keeping the lobsters alive. *Dimensions of original.*—Hull: Length (over all), 24½ feet; beam, 10½ feet; width of stem, 7½ feet; height (keel to top of rail amidships), 4¾ feet. Spars: Bowsprit (outside stem), 9 feet; mast (above deck), 26½ feet.

MUSCONGUS BAY LOBSTER-BOAT.

Model, scale 1 inch to foot. Clipper sloop; open boat; long, sharp bow; broad beam; moderately sharp floor; fine run; overhanging, square stern; center-board; short deck forward, under it a cuddy for crew's sleeping-quarters and also for storage of lobsters in cold weather; washboards on each side aft of cuddy, inclosing open space for standing room, and for stowage of barrels, &c., when cod or mackerel fishing. Friendship, Me. 55,795. U. S. Fish Commission. This model represents a class of sloop-rigged boats in general use at Muscongus Bay, Maine. They are employed in the general fisheries of the coast, but have been found exceedingly well adapted for the lobster-fishery, for which they are specially designed. They are remarkably good sailers, fine sea-boats, and perfectly manageable with jib. *Dimensions of original.*—Hull: Length, 26 feet; beam, 8 feet; mast, 25½ feet (above deck); bowsprit, 6 feet (outside); mainboom, 25¾ feet; gaff, 15 feet.

MATINICUS FISHING BOAT.

Model, scale 1 inch to foot. Sloop-rigged; open; set work; very sharp, yacht-like bow; straight stem above water-line, much

MATINICUS FISHING BOAT—Continued.

curved below; keel; high bilge; fine, clean run; elliptical stern, like clipper-schooner; some overhang; washboards; center-board; one pair rowlocks aft; two thwarts; seat around stern cockpit; ballast platformed down; fish-kid in center of boat; bulkheaded; sprit, mainsail, and jib; one pair of oars; little punt attached. Friendship, Me., 1883. 57,032. U. S. Fish Commission. Used in general fisheries on coast of Maine, especially at Matinicus Island, where they originated. They are exceedingly swift sailers, and well adapted for the work in which they are employed. *Dimensions of original.*—Hull: Length (over all), 21 feet; beam, 6¼ feet; depth, 3½ feet; draught, 3 feet. Spars: Bowsprit (outboard), 5½ feet; mast, 20½ feet (total); sprit, 16 feet.

IRISH FISHING CUTTER, OF BOSTON.

Model, scale 1 inch to foot. Sharp bow; high floor; clean run; moderate sheer; deep keel; stem straight above water-line, curved below; much drag-line; deep, square, heart-shaped stern; raking stern-post; rudder hung outside; decked forward a little less than half the length, rest open; cockpit aft; middle portion bulkheaded off for fish, and generally provided with temporary covering of boards; four thwarts; cutter-rigged, with running bowsprit; three sails, main-sail, stay-foresail, and jib. *Dimensions of original.*—Length over all, 36 feet; keel, 29 feet; beam, 9¼ feet; (height of model: stem, 7¾ inches; amidships, 7 inches; aft, 9 inches); draught of water, bow 2 feet 9 inches, aft 5 feet 8 inches; mast (above deck), 34 feet 9 inches; bowsprit (outside), 10 feet 6 inches; main-boom, 32 feet 6 inches; gaff, 21 feet 3 inches. Boston, Mass., 1883. 76,013. Collected by J. W. Collins. Boats of the class represented by this model are used quite extensively by the Irish fishermen sailing from Boston, Mass. This particular type was first introduced into the United States about 1846. It is essentially the same as the boats used on the coast of Ireland, at Galway, and known as the "Galway hooker." The model has been much improved by the Boston builders, and some of these boats have become very celebrated for speed, so much so that they have been purchased by wealthy gentlemen and converted into yachts. They are reputed to be excellent sea-boats, and almost any time, even in midwinter, they may be seen in Massachusetts Bay shooting or hauling their lines and nets.

MARTHA'S VINEYARD CAT-BOAT.

Model, scale 1 inch to foot. Long, sharp bow; broad beam; wide, heart-shaped stern; center-board; decked forward, to form

MARTHA'S VINEYARD CAT-BOAT—Continued.

cabin; cockpit aft; washboards; one sail. *Dimensions of original:* Length over all, 19¾ feet; beam, 7½ feet; height amidships, 3 feet; mast (above deck), 19½ feet; boom, 22 feet; gaff, 11 feet. Nantucket, Mass., 1875. 25,026. William H. Chase, jr. The boats represented by this model are used in carrying out fishing parties, and for the general fisheries at Martha's Vineyard and vicinity. They are also made use of as yachts along an extensive stretch of the Atlantic sea-coast. They are swift sailers in smooth water, stiff, and well adapted for service at many points where the water is shallow.

PROVIDENCE RIVER CAT-RIGGED FISHING BOAT.

Model, scale 1 inch to foot. Open; lap-streak; cat-rigged, with one sail; sharp bow; broad beam; square stern; floored in cockpit and forward compartment; between these is a fish-well pierced with holes in bottom. Built by T. D. Stoddard. Newport, R. I., 1876. 29,537. Gift of J. M. K. Southwick. These boats are used in lobster and hook-and-line fisheries; they vary in length on the keel, from 14 to 19½ feet, and cost from $225 to $425 each. *Dimensions of original.*—Hull: Length over all, 20¼ feet; keel, 17½ feet; beam, 8 feet. Spars: Mast, 22¾ feet.

CAT-RIGGED WATER-BOAT "AGUA PURA."

Model, scale 1 inch to foot. Sharp bow; broad beam; round stern; comparatively light draught; decked, with cockpit for steersman aft; pump and hose; hatchway to water-tank nearly amidships; hatchway to forehold on port side forward; keel; one large sail. Gloucester, Mass., 1883. 56,937. U. S. Fish Commission. This model represents the sail-boats which supply the fishing vessels with fresh water at Gloucester, Mass. *Dimensions.*—Hull: Length over all, 37 feet; beam, 12 feet. Spars: Length of mast above deck, 39 feet; mainboom, 37 feet; gaff, 16 feet.

NEW JERSEY SNEAK-BOX.

Model, scale 1 inch to foot. Ducking punt; single sprit-sail; center-board; adjustable cover for cockpit and washboard; canvas screen forward. *Dimensions of original:* Length, 15½ feet; beam, 5 feet; height, 1¼ feet; mast, 7½ feet. Tuckerton, N. J., 1876. 26,623. J. D. Gifford. Boats of this type are used chiefly for hunting ducks, &c., in the shallow waters along the New Jersey coast. They are from 12 to 15 feet long. The shelving, or side-boards on the stern of the boat are used to hold the decoys while the hunter rows to and from the shooting-ground.

EGG HARBOR MELON-SEED OR SPORTING BOAT.

Model, scale 2 inches to the foot. Cat-boat rig, with one sail; wide and shallow; moderately sharp bow; square stern; decked with exception of cockpit amidships, for which there is an adjustable cover. *Dimensions of original:* Length, 13⅜ feet; beam, 4¼ feet; height amidships, 1⅛ feet; mast, 8⅜ feet. Egg Harbor, 1876. 25,658. Presented by P. Brasher. These boats are used for hunting in the shallow waters of the marshes and bays bordering the New Jersey coast.

6. SCHOONER-RIGGED, SQUARE-STERNED BOATS.

TWO-MASTED CAT-BOAT "LITTLE MAUD."

Model, scale 1 inch to foot. Sharp bow; broad beam; open, square stern; fine run; washboards; partly decked fore and aft; deep keel; two masts; two sprit-sails. Boston, Mass., 1876. 26,585. Johnson & Young. This model represents a class of boats extensively used in the general shore fisheries, especially in the lobster-fishery in Northern New England. They are usually good sailers and sea-boats and easily managed; they vary in size from 18 to 25 feet in length. *Dimensions of original.*—Hull: Length over all, 19 feet; beam, 6½ feet; width of stern, 3¾ feet. Spars: Foremast above deck, 13½ feet; mainmast, 12¾ feet.

MONHEGAN FISHING BOAT.

Model, scale 1 inch to foot. Schooner-rigged; two sprit-sails (mainsail and foresail) and jib; open; washboards; center-board; two thwarts; seat around stern cockpit; platform over ballast; fish-kid amidships separated from forward and after standing-rooms by bulkheads; two masts. This boat has a sharp, yacht-like bow; high bilge; fine, clean run; elliptical stern, with considerable overhang; small keel; stem nearly straight above water-line, sharply curved below. Fitted with one pair of oars and row-locks and one fishing-line; anchor hanging to bowsprit. Friendship, Me., 1883. 57,031. U. S. Fish Commission. Used in general fisheries off the coast of Maine, more especially at Monhegan Island and Boothbay. They are rapid sailers and good sea-boats. *Dimensions of original.*—Hull: Length over all, 20½ feet; beam, 6 feet; draught, 2¾ feet. Spars: Mainmast (above thwart), 13½ feet; foremast above thwart, 19 feet; bowsprit (outside), 5 feet; mainboom, 9 feet.

TWO-SAIL FISHING BOAT OF MAINE.

Builder's model, scale 1 inch to foot. Very sharp bow; broad beam; sharp, concave bilge; narrow and deep, square stern. Phippsburg, Me., 1879. Gift of Charles H. McIntire. 54,484. This

TWO-SAIL FISHING BOAT OF MAINE—Continued.

model represents the two-masted, square-stern, center-board fishing boats of the coast of Maine. They are good sailers and very seaworthy.

7. SQUARE-STERN ROW-BOATS.

NANTUCKET HARBOR-BOAT.

Model, scale 1 inch to foot. Open; long, sharp bow; narrow beam; square stern. *Dimensions of original:* Length, 12 feet; beam, $2\frac{1}{4}$ feet; depth, 1 foot. Nantucket, Mass., 1875. 25,028. William H. Chase, jr. Used for pleasure fishing, &c.

POTOMAC RIVER SHAD SEINE-BOAT.

Model, scale $\frac{1}{2}$ inch to foot. Open, long, narrow row-boat; sharp bow; curved stem; keel; wide and full square stern; round bilge; slight sheer. Braced longitudinally with "hog-rod" to prevent keelson springing up amidships. Carries 1,200 to 1,500 fathoms of seine, which is 30 feet deep on channel end, 12 feet deep on shore end, and of $2\frac{1}{2}$ to 3 inch mesh. Rowed by 24 oars double-banked and 2 single-banked forward. *Dimensions of original:* Length, 72 feet; beam, 12 feet; height amidships, $5\frac{3}{4}$ feet. Washington, D. C., 1883. 55,877. U. S. Fish Commission. Used in the shad-fisheries of the Potomac River.

8. SHARP-STERN ROUND-BOTTOM BOATS.

QUODDY BOAT.

Builder's model, scale $\frac{1}{2}$ inch to foot. Sharp at both ends; wide beam; high bilge. Eastport, Me., 1880. Gift of Albert Hallet. 54,478. The Quoddy boat is sloop-rigged, and is largely employed in the herring and other shore fisheries in Passamaquoddy Bay and vicinity. It is celebrated for speed and seaworthiness.

MENHADEN CARRY-AWAY BOAT.

Builder's model, scale 1 inch to foot. Sharp at both ends; wide and shallow. *Dimensions of boat:* Length, 35 feet 6 inches; beam, 14 feet; depth, 3 feet 9 inches. Greenport, N. Y., 1865. Gift of Charles A. Jackson. 54,341. This is a model of a menhaden carry-away boat, style of 1865. Twelve such boats were made from this particular model. These boats were sharp at both ends, like the Block Island fishing boat, from which they originated, but were made much shallower to enable them to carry a large load on light draught of water. They were rigged with one mast and a single large sail, were generally open boats, and were quite remarkable for their stiffness and speed.

MENHADEN CARRY-AWAY BOAT—Continued.

They have been superseded by small, clipper, deck sloops, that are more suitable for the business, since the crews can remain on board.

NO MAN'S LAND FISHING BOAT.

Builder's model, scale 1 inch to foot. Sharp at both ends; broad beam. *Dimensions of boat:* Length, 17 feet; beam amidships, 6 feet. New Bedford, Mass., 1882. Gift of James Beetle, builder. 54,477. The boats built from this model are employed in the shore fisheries about Vineyard Sound and No Man's Land. They are rigged with two masts and carry two sails.

ITALIAN FISHING BOAT.

Model, scale 1 inch to foot. Felucca rig; decked; ends alike; rounding bow and stern; broad beam; low bilge; decked; one mast; lateen-sail. San Francisco, Cal., 1876. 22,213. Livingston Stone. Used by Italian fishermen of California in bay and outside fishing. *Dimensions of original.*—Hull: Length, 20 feet; beam, $7\frac{1}{4}$ feet; height, amidships $3\frac{1}{4}$ feet, ends $4\frac{1}{4}$ feet. Spars: Bowsprit, $2\frac{1}{2}$ feet; mast, $13\frac{1}{4}$ feet above deck; yard, $24\frac{1}{2}$ feet; sail, $18\frac{1}{2}$ feet on foot, 14 feet hoist, 23 feet on yard.

ITALIAN FISHING BOAT.

Model. Felucca rig; ends alike; moderately sharp bow and stern; straight stem and stern-post; broad beam; flat floor; lateen-sail; covered hatchway amidships; cockpit for steersman aft. *Dimensions of original:* Length over all, $21\frac{1}{2}$ feet; keel, 21 feet; beam, $7\frac{1}{4}$ feet. San Francisco, Cal., 1876. 22,214. Livingston Stone. These boats are used by Italian fishermen at San Francisco for fishing in the bay and ocean.

COLUMBIA RIVER SALMON-BOAT.

Model, scale 1 inch to foot. Sharp at both ends; washboards along the sides; covered for 2 to 3 feet forward and aft; four thwarts; one mast, which steps well forward; three oars. *Dimensions of original:* Length over all, $25\frac{3}{4}$ feet; beam, $6\frac{3}{4}$ feet; height, amidships $2\frac{1}{2}$ feet, ends 3 feet; oars, 12 feet long; mast, $16\frac{1}{2}$ feet. San Francisco, Cal., 1876. 22,216. Collected by Livingston Stone.

QUODDY BOAT.

Model, scale $\frac{1}{2}$ inch to foot. Sharp forward and aft; broad beam; deep, curved stem; straight stern-post; one sail. *Dimensions of original:* Length over all, 35 feet; beam, 12 feet; mast, $39\frac{1}{2}$

QUODDY BOAT—Continued.

feet. Eastport, Me., 1873. 12,099. Captain Hallet. Used in general fisheries of Eastern Maine, but chiefly employed in the herring-fishery. These boats vary from 20 to 35 feet in length; they are excellent sea-boats, stiff, and good sailers.

REACH-BOAT OF MAINE.

Model, scale 1 inch to foot. Open; lapstreak; sharp at both ends; broad beam; keel; one sprit-sail; one pair oars; two thwarts; curved stem; straight stern-post. *Dimensions of original:* Length, 15 feet; beam, $4\frac{3}{4}$ feet; mast above thwart, $11\frac{1}{2}$ feet. Jonesport, Me., 1883. 57,561. U. S. Fish Commission. This model represents the original reach-boat, extensively employed in the general fisheries of Eastern Maine. The average length of these boats is as above, though they are often built more than 20 feet long.

DOUBLE-ENDER OR PEA-POD.

Model, scale 1 inch to foot. Open; lapstreak; sharp forward and aft; rounding stem and stern-post; both ends alike; rounding bilge; keel; rudder; two thwarts; two oars; one sail. Jonesport, Me., 1883. 56,864. U. S. Fish Commission. This model (built at Jonesport, Me.) represents a class of boats used in the general fisheries of the coast of Maine, but chiefly employed in the lobster-fisheries in certain localities, the shape of the boat making it unnecessary for the fishermen to turn it around, since it can be rowed one way as well as the other. *Dimensions of original.*—Hull: Length over all, 15 feet; beam, $4\frac{1}{2}$ feet; depth, $1\frac{1}{2}$ feet. Spars: Mast, 14 feet; boom, 14 feet; gaff, 6 feet.

NO MAN'S LAND FISHING BOAT.

Model, scale $1\frac{1}{2}$ inches to foot. Open; lapstreak; sharp forward and aft; broad and deep; curved stem; straight stern-post; two masts; two sprit-sails (foresail and mainsail). Vineyard Haven, Mass., 1876. 25,898. Presented by Capt. William H. Cleveland. The style of boat represented by this model is used in the general shore-fisheries (including those for cod and lobsters) from No Man's Land and vicinty. *Dimensions of original.*—Hull: Length over all, $22\frac{2}{3}$ feet; beam, $8\frac{5}{6}$ feet; height amidships, $4\frac{1}{2}$ feet. Spars: Foremast above thwart, 15 feet; mainmast above thwart, $13\frac{1}{3}$ feet.

NEW ENGLAND SURF-BOAT.

Model, scale 2 inches to foot. Open row-boat; lapstreak; sharp forward and aft; curved stem; straight stern-post. *Dimensions of original:* Length over all, 22 feet; beam, $6\frac{1}{4}$ feet; height

NEW ENGLAND SURF-BOAT—Continued.

amidships, 3 feet; oars, 14½ feet long. Boston, Mass., 1876. 24,999. Built by Cragin & Sheldon. This represents a class of boats extensively used by the Light-House Board, and, to a less extent, by the Life-Saving Service of Northern New England. Boats of this type (but generally provided with sails) are very much in use in the coast fisheries in the locality mentioned. They are excellent sea-boats and easily propelled by oars or sails.

PURSE-SEINE BOAT.

Model, scale 1 inch to foot. Open; sharp at both ends; round bottom; keel; curved stem and stern-post; fitted with rowlocks, pursing-gear, towing-link, &c.; also purse-seine and oars. *Dimensions of original:* Length, 36 feet; beam, 8 feet; height, amidships 2¾ feet, ends 4½ feet. Gloucester, Mass., 1876. 25,826. Higgins & Gifford. This model represents the class of boats exclusively used in the mackerel purse-seine fisheries of New England. These boats vary in length from 32 to 40 feet, the larger sizes (those from 35 to 38 feet long) having come into use since 1875, while boats 40 feet long were first built in 1882. They are a modification of the whale-boat.

PURSE-SEINE BOAT.

Model, scale 2 inches to foot. Open boat; sharp forward and aft, the stern somewhat fuller than the bow; curved stem and stern post; round, smooth bilge; set work; six thwarts; nickel-plated rowlocks, pursing-gear, oar-rests, towing-link, &c.; full set of oars. *Dimensions of original:* Length, 36 feet; beam, 7 feet 7½ inches. Gloucester, Mass., 1883. 57,574. U. S. Fish Commission. This model represents the style of boat used by the American mackerel fishermen for the purpose of setting and hauling purse-seines. It also shows the fittings manufactured for seine-boats by Wilcox, Crittenden & Co., Middletown, Conn., namely, cleats, stem-cap, snatch-blocks for pursing seine, steering-oarlock with stern socket, davit-iron, tow-link and hook, belaying-pin, oar-holders, davit-guard and step-plate, breast-brace and eye-plate or oar-holder swivels, all of which are shown in this collection by full-size examples on screens.

ADIRONDACK BOAT.

Model, scale 1 inch to foot. Light wood. Combination of row-boat and canoe; sharp ends; round bottom. Fitted with one scull, one paddle, and a portage yoke. *Dimensions of original:* Length over all, 15 feet; beam, 3½ feet; height, amidships 1 foot, stern 2½ feet; weight, 75 to 80 pounds. Boston, Mass.,

ADIRONDACK BOAT—Continued.

1876. 25,681. Frederick D. Graves. This type of boat is used for hunting and fishing in the Adirondack region. "For the use of sportsmen, this boat is claimed to excel on account of its *extreme lightness* and *durability*, one man being able by means of a yoke to carry the boat to any distance without fatigue. It is also adapted for family purposes, the *patent rowlock* enabling the most inexperienced rower of either sex to propel the boat with ease and perfect safety, and without any possible chance of losing the oars."—(*Graves.*)

ADIRONDACK BOAT.

Model, scale 1½ inches to foot. Open; double-scull, lapstreak wherry; light deck at both ends; round bottom. *Dimensions of original:* Length over all, 22 feet; beam, 3⅝ feet; height amidships, 1 foot. Alexandria Bay, New York, 1876. 25,053. Cornwall & Weston. Used in Adirondack Mountains.

9. FLAT-BOTTOM BOATS.

SHORE DORY.

Model, scale 4 inches to foot. Open; flat bottom; lapstreak; slightly rounded, flaring sides; sharp bow; narrow, V-shaped stern; center-board; washboards along sides; decked forward; three thwarts; kidboards; oars; thole-pins; two sails—main-sail and jib; mast-hole in each of two forward thwarts; rudder. *Dimensions of original:* Length over all, 21 feet; beam, 5 feet; depth amidships, 21¾ inches; length of mast, 14 feet. Gloucester, Mass., 1883. 57,573. U. S. Fish Commission. The boats which this model represents are used by the shore fishermen of New England, especially at Cape Ann, the custom of the men being to fish not far from the coast and to usually return home after a day's or night's fishing. They are good sailers and excellent sea-boats.

BANK DORY.

Model, scale 4 inches to foot. Open; flat bottom; flaring sides; sharp bow; V-shaped stern; fitted with oars, thole-pins, painter stern-becket, thwarts, and kidboards. *Dimensions of full-size dory:* Length over all, 19¼ feet; beam, 5¾ feet; depth amidships, 21 inches. Gloucester, Mass., 1883. 57,572. U. S. Fish Commission. This model represents the style of dories used in the bank cod and halibut trawl-line fisheries.

FULL-SIZED BANK HALIBUT DORY.

Flat bottom, open boat, with sharp, wedge-shaped bow; straight, flaring sides; narrow, V-shaped stern. Strong sheer on top, and bottom curved slightly upwards at each end. Fitted with

FULL-SIZED BANK HALIBUT DORY—Continued.

mast and sprit-sail, two pairs 9-foot ash oars, Davis's standard (brass) row-locks, adjustable thwarts and kid boards, "hurdy-gurdy" or line winch, 2 trawl anchors, 1 coil buoy line, 1 skate trawl, 1 dory scoop, 1 bucket containing jug and woolen nippers, 2 buoys with staffs and "black balls," painter, stern becket, dory plug, &c. Length, over all 19$\frac{1}{6}$ feet, on bottom 15 feet, (the length of the bottom is the measurement usually spoken of; a dory of the above size would be called a "15-foot dory"); extreme width 5 feet, width of bottom amidships 2$\frac{2}{3}$ feet. Gloucester, Mass., 1883. U. S. Fish Commission. Boats of this type and size are exclusively used in the halibut and cod trawl-line fisheries on the outer banks, and have also in the United States very largely superseded all other kinds, even in the inshore fisheries, where the latter are prosecuted chiefly by vessels which engage in trawl-line fishing, carrying their boats on deck.

FULL-SIZED BANK COD AND HADDOCK DORY.

Flat bottom, open boat; sharp bow; flaring sides; narrow, V-shaped stern; strong sheer on top; bottom curved slightly upwards at each end. Fitted with two pairs of 9-foot ash oars, Davis's standard (brass) rowlocks, adjustable thwarts, and kid boards, 2 keg buoys with staffs and "black balls," 2 trawl-line anchors, 1 bailing scoop, 1 coil buoy line, 1 tub containing trawl-line, 1 bucket, water jug, woolen nippers, painter, stern becket, dory plug, &c. Length, over all 19$\frac{1}{6}$ feet, on the bottom 15 feet; (boats of this size are known as "15-foot dories," and, with few exceptions, are the only kind used in the off-shore trawl-line fisheries for cod, haddock, and halibut, where two men are required for the management of the boat, and for handling the gear); extreme width 5 feet, width of bottom amidships 2$\frac{2}{3}$ feet. Gloucester, Mass., 1883. U. S. Fish Commission. Used in the off-shore haddock and cod trawl-line fisheries. As a rule, a schooner carries six dories of this class, though a few take as many as seven, while small vessels, fishing nearer the land, may not have more than from two to four dories each. Each dory of this size is manned by two persons, though the smaller boats, those of 12$\frac{1}{2}$ to 13$\frac{1}{2}$ feet length on the bottom, carry only one man. The smaller dories are used comparatively little in the trawl-line fisheries, but are employed quite extensively in the hand-line cod-fisheries on the outer banks.

NEW ENGLAND DORY.

Model, scale 1 inch to foot. Open; flat bottom; sharp bow; narrow, V-shaped stern. *Dimensions of original:* Length, over all

NEW ENGLAND DORY—Continued.

19¾ feet, bottom 15 feet; beam, 5½ feet; width of bottom amidships, 2½ feet. Coast of Maine, 1873. 12,678. U. S. Fish Commission. Used in shore and bank cod and halibut fisheries.

NEW ENGLAND DORY.

Model, scale 1 inch to foot. Open; flat bottom; flaring sides; V-shaped stern. *Dimensions of original:* Length, over all 19¾ feet, bottom 15 feet; beam, 5½ feet; bottom amidships, 2½ feet wide. Coast of New England, 1874. 13,493. U. S. Fish Commission. This model represents the type of boats extensively employed in the commercial fisheries of the Atlantic coast.

NEW ENGLAND DORY.

Model, scale 1 inch to foot. Flat bottom; sharp bow; narrow, V-shaped stern; flaring sides. *Dimensions of original:* Length, on top 18½ feet, on bottom 15 feet; beam, 5 feet; depth amidships, 2 feet. Ferryville, Me., 1876. 55,792. Starling & Stevens. Used in the general fisheries of New England.

NANTUCKET CLAMMER'S DORY.

Model, scale 1 inch to foot. Open; sharp bow; narrow, V-shaped stern; flat bottom; flaring sides; fitted with one pair of sculls, clam-rake, and tub. *Dimensions of original:* Length over all, 16½ feet; beam (gunwale to gunwale), 4 feet; width of bottom amidships, 2½ feet. Nantucket, Mass., 1876. 25,657. W. H. Chase, 2d. Used by clam-gatherers at Nantucket and vicinity.

CONNECTICUT SHARPY.

Model, scale 1 inch to foot. Open; flat bottom; center-board; sharp bow; wide, square stern; single mast; leg-of-mutton sail; 2 oars. *Dimensions of original:* Length, 14½ feet; beam, 4¾ feet; height, amidships 1¾ feet, stem 1¾ feet, stern 2 feet; mast, 13 feet. Noank, Conn., 1875. 24,752. Capt. H. C. Chester. Boats of this class are employed in the general shore fisheries of Southern Connecticut. A large boat of the same model, but usually rigged with two sails, is used in the oyster business.

LOOKOUT BOAT.

Model, scale ½ inch to foot. Open; flat bottom; sharp forward; broad, square stern; 2 pairs sculls. Washington, D. C., 1883. 55,878. U. S. Fish Commission. Used as tender to shad-seine boat, No. 55,877.

LAKE ERIE POUND BOAT.

Model, scale 1 inch to foot. Flat bottom; sharpy model; center-board; straight sides; square stern; open; washboards; rigged

LAKE ERIE POUND BOAT—Continued.

complete with spars, &c. Two sails—three-cornered above the gaffs, like gaff-topsails. Chicago, Ill., 1876. 26,790. J. W. Milner. These boats are used in the pound fisheries of the Great Lakes, and their peculiar construction enables them to carry large quantities of fish in shallow water and to lift the bowl of the pounds without upsetting. *Dimensions of original.*—Hull: Length (stem to stern), 24¾ feet; beam, 9½ feet; width of stern, 7 feet; depth amidships, 3 feet. Spars: Foremast, 23¼ feet; mainmast, 21½ feet.

POTOMAC FISH-LIGHTER.

Model, scale ⅜ inch to the foot. Flat bottom, flat-iron shaped; decked with long, wide hatchway, covered with four hatches; cuddy aft; rudder; towing-bit forward. *Dimensions of original:* Length over all, 52 feet; beam, 14⅔ feet; depth of hold, 5⅓ feet. Washington, D. C., 1883. 56,950. Presented by George Woltz. These boats vary in length from 45 to 60 feet, and are used for transporting fish from the lower Potomac to market. A boat is anchored near each fishing station on the river and the daily catch of fish is put on board. At a certain time of day the boats are picked up by a steam-tug, which tows ten to fifteen of them to Washington. They are invariably covered with coal-tar.

FISHING-BOAT.

Model. Open; flat bottom; sharp ends; no run; little sheer; partially decked over fore and aft; carries lateen sail on 29¼-inch yard. Length, 28 inches; height, amidships 2¼ inches, ends 3¼ inches, mast 15 inches, to top of sail 3¾ inches, total 21 inches; beam, 5¼ inches; floor, 3¼ inches. San Francisco, Cal., 1876. 22,217. Collected by Livingston Stone. This is used by the Chinese fishermen of San Francisco Harbor—principally by shrimp-catchers.

CHINESE SHRIMP-BOAT.

Model, scale 1 inch to foot. Flat bottom; decked; square ends; strong sheer; single mast; one square sail; long hatchway, with high combings; adjustable rudder. Equipped with 4 oars, 3 boat-hooks, and one three-pronged anchor. San Francisco, Cal., 1883. 55,775. U. S. Fish Commission. Used in shrimp-fishing in San Francisco Bay, and generally in California. *Dimensions of original.*—Hull: Length, 31½ feet; beam, 11 feet; width of floor, 6 feet; height, amidships 3½ feet, stem 7½ feet, stern 8½ feet. Mast, 26 feet long.

AU SABLE FISHING BOAT.

Model, scale 2 inches to foot. Made of white pine; bottom nearly flat for 8 feet in center; sheer of 5 inches at bow, 7 inches at stern; well, 6 feet from bow, extends 2 feet; will carry 2 men and 200 pounds of baggage steadily; setting-pole used exclusively; cost $15. *Dimensions of original:* Length over all, 18½ feet; beam, 3½ feet; width of bottom, 2½ feet; depth amidships, 1⅛ feet. Bay City, Mich., 1876. 25,899. Gift of D. A. Fitzhugh, jr. Used for trout and grayling fishing in rapid streams.

10. PORTABLE BOATS.

COLVIN PORTABLE CANVAS BOAT.

Model, scale 2 inches to foot. Patented October 6, 1874. Albany, N. Y. 22,218. R. A. Scott & Co. "This boat consists of a canvas exterior, made thoroughly water-proof by a preparation which preserves the strength of the canvas and prevents decay and oxidation. It is shaped like a canoe, sharp at both ends, and cuts the water handsomely. Along the sides and bottom are leather thongs, by which the boughs and limbs cut for frame can be lashed securely to the canvas, with the assistance of the four leather framing-blocks or sockets (two for each end), which connect the stem and stern posts (or prow pieces) with the keelson; and it can be readily put together anywhere in the woods, no tools being required for the purpose, excepting an ax or hatchet. The whole of it can be packed away in a space 24 inches long, 6 inches wide, and 3 inches thick. The size now made (No. 3), although but 12 feet long, will carry six men, or four men with their necessary baggage, and weighs but 12 pounds when rolled up. It has been tested in a heavy sea with a frame of green boughs cut only two hours before, and carried a weight of 700 pounds safely and easily."

OSGOOD'S PORTABLE FOLDING CANVAS BOAT.

Manufactured by Osgood & Chapin, Battle Creek, Mich. 42,841. The following sizes are manufactured: Length, 12 feet; width, 33 inches; depth, 12 inches; weight, 45 pounds; length of oars, 6½ feet; price, $35. Length, 15 feet; width, 36 inches; depth, 13 inches; weight, 70 pounds; length of oars, 6½ feet; price, $45.

Size of chest.—For 12-foot boat: 38 inches long, 17 inches wide, 18 inches deep. For 15-foot boat: 40 inches long, 20 inches wide, 22 inches deep.

"The 12-foot boat is designed for two men; will carry 600 pounds, and draw 4 inches of water. The 15-foot boat is designed for four men; is rigged with two pairs of oars, will carry 850

OSDOOD'S PORTABLE FOLDING CANVAS BOAT—Continued.

pounds, and draw four inches of water. The jointed stretcher is used in place of the sectional bottom board, with two side-boards, one each side of stretcher. The boat set up this way only weighs 20 pounds, and makes a very convenient boat for trout-fishing, duck-hunting, or exploring in ponds or streams where the paddle will do as well as the oars. A box of water-proofing fluid, with directions, sent with each boat. The canvas is woven to order for this special use, and is stronger than the usual thickness of birch-bark or cedar canoes. The water-proofing leaves the canvas soft, preserves the fiber, prevents mildew, and renders it impervious to water. The ribs are red elm, the bottom-board and oars basswood, which is filled with patent wood filling, preventing the water from penetrating the wood. The rowlocks and square staples are of malleable iron. This boat can be propelled rapidly; it is very staunch; will not tip over by rocking, or by climbing into it from bathing; and can be made ready for the water in two minutes, and requires no tools or ingenuity to set it up."

FENNER'S PORTABLE BOAT.

Model, scale 3 inches to foot. Wooden extension frame, over which a canvas cover is laced, lashed, and stopped at ends; flat bottom; square ends Thwarts act as braces to keep frame in place. *Dimensions of original:* Length, 10 feet; beam, $3\frac{1}{2}$ feet; width of bottom, $2\frac{3}{4}$ feet. Mystic River, Conn., 1876. 25,879. C. A. Fenner. Used by sportsmen.

HEGEMAN PORTABLE FOLDING BOAT.

Length, 10 feet; width, 3 feet. Ballston Spa, N. Y. 29,506. Hegeman Portable Folding-Boat Company. Directions for setting up the boat: 1. Unfold the frame. 2. Place the knees and seats in position before fastening the bottom-end section at the end of the boat. 3. Fasten the bottom-end section to the ends of the boat by the thumb-screws. 4. Place on the canvas with the cords and tie in a single loop (or bow-knot).

STRANAHAN FOLDING CANVAS BOAT.

Length, 10 feet. "These boats are a combination of lightness, strength, and durabilty, such woods being selected as give these qualities in the highest degree, and all made upon honor from first to last. The water-proof gum which we use renders the duck water-tight and water-proof, and at the same time preserves the strength of the fiber and protects the cloth from mildew and mold, being of uniform pliability in both intense hot and cold weather. . . . . Each

STRANAHAN FOLDING CANVAS BOAT—Continued.

boat has an adjustable stretcher attached to the stern, which provides for stretching the cloth as taut as a drum-head. The real capacity of the boat is greater than given in the table, but they will carry the weights given with perfect ease. . . . . The 10-foot boat has eleven ribs; the 12-foot, fifteen; the 15-foot, nineteen. This brings the ribs so close together that (combined with the bilge or stiffening slats which are placed at equal distances between the gunwales and bottom) all bagging of the cover is obviated. The bow and stern pieces, gunwales, bilge slats, and ribs are made of second-growth red elm; the bottom strips, stools, oars, and paddles are of second-growth linden (basswood). The gunwales are $1\frac{7}{8}$ inches wide by $\frac{1}{4}$ inch thick, the ribs and side slats $1\frac{1}{8}$ by $\frac{1}{4}$ inches; bottom slats 1 by $\frac{5}{8}$ inch. The frame has three strips the size of the ribs, running lengthwise of the bottom, outside of the ribs, being fastened together with wrought nails firmly clinched. The frame is cut in the center at the two ribs nearest together, ... the pieces cut alternating on each rib, the fastening at each gunwale and at two points on the bottom, with wrought-iron latches fastened with thumbscrews. We also make them in three sections, at an additional cost of $3. The canvas is secured to the frame by leather straps buttoned to the inside of the gunwales over round-headed screws. The frames are neatly painted and trimmed, each strip primed before they are put together, making every part impervious to the water. The oars and paddles are copper-tipped and finished with varnish. In shipping, the canvas is entirely removed, folded compactly, and secured to the inside of the frame with the stools and oars, making one complete package, so that nothing can be misplaced or lost, and no danger or damage to the canvas. We claim the following advantages for our boat: It is the lightest complete boat made of its size, length and breadth considered. The duck is made in one piece and therefore the only seams below water-line are those at the ends, which are as strong as any other part of the cloth. It will stand as heavy a sea as any wooden boat of the same size. They are pointed at both ends, and straight and flat on the bottom. There are two sets of rowlocks in each boat, one to use when one or three persons are using it, the other when there are two, thus maintaining a 'trim' position in the water. The construction of the boat is such that the cloth is kept out to its place and a good shape maintained, which cannot be done with the majority of canvas boats. They being flat on the bottom makes them very steady for shooting or casting while standing, a very desirable point, as every practical

STRANAHAN FOLDING CANVAS BOAT—Continued.

sportsman knows. They also make a desirable family pleasure boat, and a sail can be attached if desired. The boat can be folded and made ready for transportation in a few minutes, and unfolded and put together ready for use, in the same length of time, no tools being required. Any of the modern rowing gears can be applied and used. Prices given in the table are for boats with oars and stools. . . . . Paddles furnished with boats if desired at 75 cents apiece extra. We also furnish shoulder straps for carrying the boat when desired. By means of these straps one man can carry the boat, when folded, almost any distance with perfect ease, both hands being free. Price of straps and fixtures $1 extra. These boats when folded occupy one-half their size in length, being in two sections, the full width being maintained. The three sections when folded occupy one-third their size in length, the full width being maintained. We manufacture three sizes, of the following dimensions and weights, with oars and stools:

"10-foot boat, price $20; width at bottom, 18 inches; capacity, 400 pounds; width at top, 32 inches; oars, one pair; depth at center, 11 inches; number stools, two; depth at ends, 15 inches; 6-foot oars; weight, 35 pounds.

"12-foot boat, price $25; width at bottom, 26 inches; capacity, 600 pounds; width at top, 38 inches; oars, one pair; depth at center, 13 inches; number stools, three; depth at ends, 17 inches; 6½-foot oars; weight, 50 pounds.

"15-foot boat, price $35; width at bottom, 28 inches; capacity, 800 pounds; width at top, 40 inches; oars, two pairs; depth at center, 14 inches; number stools, four; depth at ends, 18 inches; 6½-foot oars; weight, 65 pounds.

"For boats in three sections add $3 to price."—(*Holmes.*)

Chagrin Falls, Ohio, 1883. 37,630. Exhibited by Frank Holmes. Used for hunting and fishing.

11. SPORTSMEN'S BOATS.

SHOOTING BOX.

Model. A rectangular, box-shaped punt, with a projecting platform on all sides. Connected with this platform, by hinges, are double folding platforms, or what may be termed wings. These may be closed over the platform next the boat, or spread out to their fullest extent on the water's surface by the occupant of the shooting-box. *Dimensions of original:* Length of box, 7 feet; width, 2½ feet; width of platform next to box, 2 feet; extreme length with wings extended, 20 feet; extreme width, 14 feet.

New Jersey, 1880. U. S. Fish Commission. Shooting-boxes of

SHOOTING BOX—Continued.

this description are extensively used by hunters of sea fowl in the shallow inlets and streams near to or bordering the Atlantic coast of the United States, more particularly in New Jersey. Having reached the desired locality (two or more men generally go in a boat, taking the shooting-box along) the shooting-box is moored, the hunter takes his place in it, the wings are extended, and the decoys are placed in their proper positions around the box. Everything being arranged, the occupant of the box lies down flat on his back, with one gun in his hand and perhaps others beside him, and is ready to fire at any sea fowl that may fly near. The little box is about on a level with the water, upon which the wings rest.

12. BARK CANOES.

CANOE.

Model. Light wooden frame, covered with birch-bark lashed over gunwale; seams and joints paid with rosin. Round bottom; pointed ends. Length, 13 inches; beam, 3½ inches. Height, ends 3½ inches, amidships, 3 inches. Bristol Bay, Alaska, 1882. 55,906. Collected by Charles L. McKay.

13. SKIN BOATS AND CANOES.

SKIN BOAT.

Circular; made by stretching buffalo hide over a frame-work made of the boughs of trees. Diameter, 5⅙ feet; depth, about 18 inches. Fort Buford, Dakota. 9,785. Dr. W. Matthews, U. S. A. Used by Hidatza (Gros Ventres) Indians for crossing streams, &c.

SKIN CANOE OR "BIDARRA."

Model. Light wooden frame lashed with sinews and covered with skin, the covering lashed with thongs of skin over the gunwales to rib-bands on the inside; flat-bottom; sharp ends, projecting at top; single mast, supported by stays and shrouds of seal skin; one square sail of coarse matting fastened to yard with sinews; braces of seal-skin; 2 oars; 4 paddles. *Dimensions:* Length, over all 46 inches, bottom 30 inches; beam, 13½ inches; bottom, 6 inches wide; height, amidships 5¾ inches, bow 6 inches, stern 9½ inches; mast, 27 inches; yard, 25 inches; sail, 24 by 24 inches; oars, 21½ inches; paddles, 12½ to 14 inches. Saint Michael's, Alaska, 1883. 38,882. Collected by E. W. Nelson.

BIDARKA AND ALEUT FISHERMAN.

A full-size skin canoe, called a "bidarka" by the natives of Alaska, with the figure of an Aleut fisherman sitting in it with his spear poised in his right hand as in the act of throwing it. Alaska. U. S. Fish Commission.

GREENLAND KYAK.

A full-size skin canoe, called a "kyak" by the natives of Greenland, fitted with paddles, spears, &c., complete.

14. DUG-OUT CANOES AND BOATS.

CANOE.

Model. Rough dug-out; gunwale curls inboard; round bottom, square ends that rise to point. Length over all, 14¼ inches. Height, amidships 3 inches, beam 9 inches, ends 7½ inches. Hoopah Indians, Trinity River, Cal., 1876. 21,359. Collected by S. Powers.

CANOE.

Model. Dug-out; sharp bow; square stern; round bottom; 4 oars, 13 inches long. Length, 34 inches. Height, amidships 3 inches, stem 4 inches, stern 4¼ inches. Beam, 6¼ inches. 55,820.

LARGE CANOE.

Model. Wood; round bottom; long, high projecting ends. Length, 31½ inches. Height, amidships 2½ inches, stem 6 inches, stern 5½ inches. Beam, 6¼ inches. Mast, 19 inches high. 5 paddles. Northwest coast of America, 1862. 639. George Gibbs. Used by Indians in whaling and sea-fisheries.

FISHING CANOE.

Model of fishing canoe. Design of carving and painting, totem of the crane ("Tatl"). Length, 49¼ inches. Haidah Indians, northwest coast United States of America, 1883. 72,685. James G. Swan.

FISHING CANOE.

Model of fishing canoe. Totem, gull ("Skina"). Length, 29¾ inches. Haidah Indians, northwest coast United States of America, 1883. 72,686. James G. Swan.

TRAVELING CANOE.

Model of traveling canoe. Design, owl ("Goot gooneu"). Length, 37½ inches. Haidah Indians, northwest coast United States of America, 1883. 72,687. James G. Swan.

FISHING CANOE.

Model of fishing canoe. Design the wolf ("Koorts"). Length, 33½ inches. Haidah Indians, northwest coast United States of America, 1883. 72,688. James G. Swan.

FISHING CANOE.

Model of fishing canoe. Totem, albatross ("Sangar"). Length, 35 inches. Haidah Indians, northwest coast United States of America, 1883. 72,689. James G. Swan.

FISHING CANOE.

Model of fishing canoe with the totem of the large round clam ("Skung"). Length, 34 inches. Haidah Indians, northwest coast United States of America, 1883. 72,690. James G. Swan.

FISHING CANOE.

Model of fishing canoe. Totem, wolf-fish (*Anarrichthys felis*) ("Stahun"). Length, 28 inches. Haidah Indians, northwest coast United States of America, 1883. 72,691. James G. Swan.

CHINESE FISHING BOAT.

Model, scale 1 inch to foot. Unpainted wood; roughly made; narrow, flat bottom; slightly rounding bilge; straight sides; square ends; narrow beam; strong sheer. Dug out of solid log, the ends being nailed on. Divided into four compartments by bulkheads; washboards on the sides. Fitted with two long sweeps and poling-stick. The sweeps are held to the single thole-pin by a becket. *Dimensions of original:* Length, 20 feet; beam, $3\frac{1}{2}$ feet; depth amidships, $2\frac{1}{4}$ feet. U. S. Fish Commission. 72,744. Used by Chinese fishermen on the coasts of California and Oregon.

CHESAPEAKE OYSTER-BOAT.

Model, scale 1 inch to foot. Dug-out; open; washboard; widest forward of amidships. Carries a pair of oyster-tongs and a pair of oars. Baltimore, Md., 1875. 25,003. T. B. Ferguson. These boats are used in the oyster-fisheries of Chesapeake Bay and River. *Dimensions of original.*—Hull: Length, $27\frac{1}{2}$ feet; height amidships, $3\frac{1}{4}$ feet; beam, $5\frac{1}{4}$ feet. Oars, 9 feet; tongs, 17 feet long with heads 2 feet wide. Spars: Foremast, $20\frac{1}{4}$ feet; mainmast, $16\frac{1}{4}$ feet.

CHESAPEAKE BAY OYSTER-BOAT.

Model, scale 1 inch to the foot. Dug-out; long and narrow; rounding bottom; 2 masts, very much raked; 2 leg-of-mutton sails and jib; carries a pair of oyster-tongs. Baltimore, Md., 1880. 39,151. Presented by T. B. Ferguson. This model represents a class of boats used more or less extensively in the oyster-fisheries of Chesapeake Bay and its tributaries. These boats are formed from the trunks of trees. *Dimensions of original.*—Hull: Length, over all $27\frac{1}{2}$ feet, keel 25 feet; beam, 4 feet. Spars: Foremast, $26\frac{1}{4}$ feet; mainmast, $20\frac{1}{2}$ feet; bowsprit, outside stem, $2\frac{1}{2}$ feet.

SKETCHES AND PHOTOGRAPHS OF VESSELS AND BOATS.*

SERIES OF INDIA-INK AND CRAYON SKETCHES, AND LARGE PHOTOGRAPHS, 30 BY 40 INCHES, AND A LARGE SERIES OF PHOTOGRAPHS, 8 BY 10 INCHES, SHOWING FISHING BOATS AND VESSELS IN DIFFERENT SITUATIONS.

15. GENERAL VIEWS OF FISHING FLEETS, AT SEA AND IN PORT.

WHARF AND FISHING FLEET.

General view of the fishing fleet and wharf at Commercial wharf, Boston, Mass., from a line even with the dock. Boston, Mass., 1882. (Photo. No. 1805.) U. S. Fish Commission. Commercial Wharf, Boston, is the great depot in New England where fresh sea fish—cod, haddock, and others of the *Gadidæ*, as well as mackerel, herring, &c.—are landed and shipped by rail to various parts of the United States and Canada. In former years it used to have a monopoly of the fresh halibut trade, but now that branch of the fishery finds its principal market at Gloucester, which is the only New England port that has a large fleet engaged in this business.

FISHING SCHOONERS AND BOATS AT THE WHARF.

View of Milliken's Dock, Eastport, at low tide, with fishing vessels and boats lying at the wharves. Eastport, Me., 1882. (Photo. No. 1926.) U. S. Fish Commission.

FISHING FLEET AT PORTLAND.

View of D. L. Fernald's and C. A. Dyer's wharves, with fleet of vessels loading and unloading. Portland, Me., 1882. (Photo. No. 1864.) U. S. Fish Commission.

WHARVES AND FISHING VESSELS.

View along the water-front, looking southwest from wharf of John Pew & Sons. Gloucester, Mass., 1882. (Photo. No. 2094.) U. S. U. S. Fish Commission.

FISH WHARF.

Wharf of D. C. & H. Babson. Gloucester, Mass., 1882. (Photo. No. 2096.) U. S. Fish Commission.

WHARVES AND WHALING FLEET.

View of New Bedford wharves and whaling vessels. New Bedford, Mass., 1882. (Photo. No. 2143.) U. S. Fish Commission.

---

*These photographs have all been made by T. W. Smillie, of the Smithsonian Institution, Washington, D. C. The sketches have, with few exceptions, been made by H. W. Elliott and J. W. Collins.

GLOUCESTER HARBOR AND FISHING FLEET.

Gloucester Harbor, looking up from Ten Pound Island. Gloucester, Mass., 1882. (Photo. No. 2017.) U. S. Fish Commission.

GLOUCESTER OUTER HARBOR.

View of Gloucester, and the outer harbor, from Eastern Point; vessels in the outer harbor under sail and in various positions. Irish boat with three sails set. Gloucester, Mass., October 21, 1882. (Photo. No. 2018.) U. S. Fish Commission.

GLOUCESTER HARBOR.

Gloucester from Black Bess, Eastern Point. Gloucester, Mass., 1882. (Photo. No. 2022.) U. S. Fish Commission.

GLOUCESTER HARBOR.

View of Gloucester Harbor from Railcut Hill. Gloucester, Mass., 1882. (Photo. No. 2041.) U. S. Fish Commission.

GLOUCESTER HARBOR AND FLEET.

Views of Gloucester city, harbor, and fishing fleet, from Blake's Hill, East Gloucester. Gloucester, Mass., 1882. (Photos. Nos. 2077 to 2080.) U. S. Fish Commission.

GLOUCESTER INNER HARBOR AND FLEET.

Views of the inner harbor and fishing fleet from end of Rocky Neck. Gloucester, Mass., 1882. (Photos. Nos. 2081 and 2082.) U. S. Fish Commission.

HARBOR COVE AND FLEET.

View of Harbor Cove, Fort Wharf, fishing fleet, &c., from Rocky Neck. Gloucester, Mass., 1882. (Photo. No. 2083.) U. S. Fish Commission.

GLOUCESTER HARBOR AND FLEET.

Views of Gloucester city and harbor, with fishing fleet, looking westerly from Point Hill, at the head of the harbor. Gloucester, Mass., 1882. (Photos. Nos. 2085 to 2087.) U. S. Fish Commission.

16. FISHING STEAMERS.

WHALING STEAMERS.

Sketch of the steam whaling bark Mary and Helen. This ship was afterwards purchased by the United States Government, renamed the Rodgers, and sent to the Arctic in search of the Jeannette. She was finally destroyed by fire on the Siberian coast.

OYSTER STEAMER.

Sketch of an oyster steamer at work dredging oysters. New Haven, Conn., 1883. U. S. Fish Commission.

MENHADEN STEAMER.

Steamer Joseph Church, of Tiverton, R. I., arriving in port, loaded with 500 barrels of menhaden caught October 10 and 11, off Delaware Breakwater. Tiverton, R. I., 1882. (Photo. No. 1989.) U. S. Fish Commission.

SARDINE STEAMER.

Steam tug employed at Eastport for towing loaded fishing boats to the sardine factories. Eastport, Me., 1882. (Photo. No. 1933.) U. S. Fish Commission.

17. SQUARE-RIGGED FISHING VESSELS AND FREIGHTERS.

SALT-SHIP.

Salt-laden bark discharging at Pew's Wharf. View from Five Pound Island. Gloucester, Mass., 1882. (Photo. No. 1840.) U. S. Fish Commission. Large quantities of salt are brought to Gloucester, from Cadiz, Spain, from Trapani, and other ports, to be used in curing fish.

REPAIRING WHALING VESSEL.

Views of a whaling vessel heeled or "hove down" for repairs. Deck view of same; near view of same. New Bedford, Mass., 1882. (Photos. Nos. 2136, 2137, and 2145.) U. S. Fish Commission.

18. FISHING SCHOONERS.

PINKEYS.

PINKEY.

Pinkey schooner Laurel, of Friendship, Me., lying at wharf at Portland, with foresail unbent, fitting out for a herring trip to Wood Island, Maine. Portland, Me., 1882. (Photo. No. 1864.) U. S. Fish Commission.

PINKEY.

Pinkey under sail. Eastport, Me., 1882. (Photo. No. 1934.) U. S. Fish Commission.

PINKEY AT ANCHOR.

Pinkey Senator, of Gloucester, at anchor on the "Old Southeast," a fishing ground off Half-Way Rock, Massachusetts Bay. Crew employed in pollock-fishing. The view (30 by 40 inches) includes fishing boats also. The Senator was built at Essex in 1831, and is the only vessel of her class now sailing from Gloucester. Massachusetts Bay, 1883. (Photo. No. 1940.) U. S. Fish Commission.

MACKEREL-FISHING VESSELS.

MACKEREL SCHOONER.

Mackerel schooner Oasis, of North Haven, Me., becalmed at the entrance to Portland Harbor. Vessel under foresail, mainsail, two jibs, and main gaff-topsail; towing seine-boat and dory. Her catch in 1882 was 1,500 barrels of mackerel; total stock, $9,000. Built about 1863. Portland, Me., 1882. (Photo. No. 1865.) U. S. Fish Commission.

MACKEREL SCHOONER.

Mackerel schooner Laura Nelson, of Gloucester, off Half-Way Rock, Massachusetts Bay; flying-jib down, seine-boat and dory towing; men at work on deck dressing mackerel. Massachusetts Bay, 1882. (Photo. No. 1935.) U. S. Fish Commission.

MACKEREL SCHOONER.

Mackerel schooner Mabel Dilloway, of Gloucester, cruising on the fishing ground in Massachusetts Bay. The schooner is standing along by the wind, close-hauled, on the port tack. This photograph (30 by 40 inches) gives a good idea of the general appearance and rig of the best class of vessels employed in the purse-seine mackerel fishery. The seine-boat and dory are towing astern, and a man at the foremast-head is looking out for schools of mackerel. The balloon-jib, fore gaff-topsail, and main staysail are not set. Other vessels of the mackerel fleet are in the distance. Massachusetts Bay, 1882. (Photo. No. 1936.) U. S. Fish Commission.

MACKEREL FISHING FLEET.

View of the mackerel fleet under sail searching for mackerel; harbor and city of Gloucester in the distance; schooner Ellen M. Adams, of Gloucester, in the foreground. Massachusetts Bay, 1882. (Photo. No. 1939.) U. S. Fish Commission.

MACKEREL SCHOONER.

View of schooner Frank Foster, of Gloucester, lying at a wharf at East Gloucester; seine-boats astern; deck filled with mackerel in barrels; crew at work dressing fish. Gloucester, Mass., 1882. (Photo. No. 1968.) U. S. Fish Commission.

MACKEREL SCHOONER.

Schooner Daniel Marcy, of Boston, bound out mackereling; balloon-jib set. Gloucester, Mass., 1882. (Photo. No. 2009.) U. S. Fish Commission.

MACKEREL SCHOONER.

Mackerel schooner A. R. Crittenden, of Gloucester, under sail, on starboard tack; man aloft looking for mackerel. Massachusetts Bay, 1882. (Photo. No. 1937.) U. S. Fish Commission.

MACKEREL SCHOONER RUNNING FOR MARKET.

Schooner A. R. Crittenden running for market with mainsail, foresail, jib, flying-jib, balloon-jib, main gaff-topsail, and staysail set. Massachusetts Bay, 1882. (Photo. No. 1941.) U. S. Fish Commission.

MACKEREL SCHOONER LEAVING PORT.

Mackerel schooner Grace A. Choate, of Portsmouth, N. H., standing out of Gloucester Harbor. Gloucester, Mass., 1882. (Photo. No. 1943.) U. S. Fish Commission.

MACKEREL SCHOONER OUTWARD BOUND.

Three views of schooner James Bliss, of Gloucester, running out of Gloucester Harbor. Gloucester, Mass., 1882. (Photos. Nos. 1946, 1946*a*, 1947.) U. S. Fish Commission.

MACKEREL SCHOONER GETTING UNDER WAY.

Schooner Robert Pettis, of Swan's Island, Maine, head on, getting under way from Atlantic Wharf. Gloucester, Mass., 1882. (Photo. No. 1951.) U. S. Fish Commission.

SCHOONER GETTING UNDER WAY.

Mackerel schooner Alaska, mainsail up, hoisting foresail and about to weigh anchor. Gloucester, Mass., 1882. (Photo. No. 1955.) U. S. Fish Commission.

MACKEREL SCHOONER LEAVING PORT.

Schooner A. R. Crittenden leaving Gloucester Harbor for the fishing ground, four lower sails and gaff-topsail set. Gloucester, Mass., 1882. (Photo. No. 2013.) U. S. Fish Commission.

MACKEREL SCHOONER IN PORT.

Mackerel schooner Edward E. Webster at anchor in Gloucester Harbor. Gloucester, Mass., 1882. (Photo. No. 2089.) U. S. Fish Commission.

FISHING SCHOONER ENTERING HARBOR.

Fishing schooner Piscataqua, of Gloucester, lowering her mainsail while entering the harbor. Gloucester, Mass., 1882. (Photo. No. 1848.) U. S. Fish Commission.

MACKEREL SCHOONER FILLING WATER.

Schooner Alaska, of Gloucester, taking in a supply of fresh water from water-boat. Gloucester, Mass., 1882. (Photo. No. 1950.) U. S. Fish Commission.

FISHING SCHOONER.

Schooner M. A. Baston, coming bow on, under three lower sails, balloon-gib, gaff-topsail, and staysail. Gloucester, Mass., 1882. (Photo. No. 2019.) U. S. Fish Commission.

HIGH-LINE MACKEREL SCHOONERS.

Schooners, Nellie M. Rowe (Capt. Eben Lewis), Edward E. Webster (Capt. Solomon Jacobs), and Warren J. Crosby (Capt. Hans Joyce). The two former vessels (the Rowe being on the left and the Webster in the middle) belong to Gloucester, the other hails from Portland, Me. The captains of those vessels are the three most fortunate mackerel fishermen of the United States; they are called the three great "fish killers." Gloucester, Mass., 1882. (Photo. No. 2104.) U. S. Fish Commission.

NOVA SCOTIA MACKEREL SCHOONER.

View of Gloucester Harbor from Rocky Neck. In the foreground, with British ensign in main rigging, is the schooner Festina Lente, of Lockport, Nova Scotia, Capt. Andrew Hammond; engaged in purse seine mackerel fishing off the New England coast. Gloucester, Mass., October 26, 1882. (Photo. No. 2106.) U. S. Fish Commission.

COD-FISHING VESSELS.

COD-TRAWLING SCHOONER.

Schooner Massena coming into port from a cod fishing trip to the Western Bank. Gloucester, Mass., 1882. (Photo. No. 2016.) U. S. Fish Commission.

GEORGE'S COD-FISHING SCHOONER.

View of the deck of the George's-man Laura Sayward, of Gloucester. This view shows the arrangement of gurry-pens on deck, the fishing rails, &c. Gloucester, Mass., 1882. (Photo. No. 2032.) U. S. Fish Commission.

COD-FISHING SCHOONER. (Shore trawler.)

Schooner Onward, bound in from shore cod-trawling. Gloucester, Mass, 1882. (Photo. No. 2007.) U. S. Fish Commission.

COD-FISHING SCHOONERS.

Schooners Northern Star and Lady Lincoln under way. Gloucester, Mass., 1882. (Photo. No. 2008.) U. S. Fish Commission.

COD-FISHING SCHOONER. (Trawler.)

Schooner Racer of Gloucester, one of the Western Bank cod-trawlers, jogging in the outer harbor, waiting for part of her crew to come on board. This vessel was built at Essex, in 1852, and is one of the first of the so-called "sharp-shooters." Gloucester, Mass., 1882. (Photo. No. 1948.) U. S. Fish Commission.

COD-FISHING SCHOONER. (Hand-liner.)

George's cod-fishing schooner Otis P. Lord, of Gloucester, at anchor in Gloucester Harbor, mainsail and foresail up. Gloucester, Mass., 1882. (Photo. No. 1949.) U. S. Fish Commission.

GRAND BANK COD-TRAWLER LEAVING PORT.

View of Gloucester Harbor and fishing fleet. In the foreground is a Grand Bank cod-trawler being towed out of the harbor by a steam tug. Gloucester, Mass., 1882. (Photo. No. 2103.) U. S. Fish Commission.

FRESH HALIBUT VESSELS.

HALIBUT SCHOONER.

India-ink sketch (30 by 40 inches) of a halibut schooner on her homeward passage in winter, headreaching in a northwest gale, under two-reefed foresail, riding sail, and jib with the bonnet out. The vessel is represented as being iced up, which is generally the case under such conditions. Drawn by H. W. Elliott and J. W. Collins.

HALIBUT SCHOONER "MARION."

Sketch (30 by 40 inches) of the halibut schooner Marion, of Gloucester, Mass., at anchor on the Grand Bank. The crew is represented as engaged in baiting their trawl-lines on deck. Drawn by H. W. Elliott and J. W. Collins.

FISHING SCHOONER LYING-TO IN A GALE.

Sketch (30 by 40 inches) of a fishing schooner lying-to in a heavy winter's gale. The vessel is on the port tack and has a two-reefed foresail and a reefed riding sail set. This is the sail under which these vessels generally lie-to in a gale. Drawn by H. W. Elliott and J. W. Collins.

FISHING SCHOONER TRIPPED BY A SEA.

Sketch (30 by 40 inches) of a fishing schooner tripped and knocked down by a sharp, breaking sea, while scudding in a gale. It is not an unusual circumstance for fishing schooners to be thrown on their beam-ends in heavy gales, and it is believed many are lost in this manner. Drawn by H. W. Elliott and J. W. Collins.

FISHING SCHOONER AT ANCHOR IN A GALE.

Sketch (30 by 40 inches) of a fishing schooner riding out a winter's gale at anchor on the Grand Bank. The vessel is very much iced up. Drawn by H. W. Elliott and J. W. Collins.

FISHING VESSEL'S CABIN.

Sketch of the interior of the cabin of the schooner John D. Long, of Gloucester, Mass. The crew off duty are in the cabin, reading, sleeping, &c. Drawn by H. W. Elliott. Gloucester, Mass., 1882. U. S. Fish Commission.

HALIBUT SCHOONER OUTWARD BOUND.

Fresh halibut catcher rounding Eastern Point; bound to the outer fishing banks. Three lower sails and gaff-topsail set. Gloucester, Mass., 1882. (Photo. No. 2036.) U. S. Fish Commission.

HERRING CATCHERS.

HERRING SCHOONER.

Schooner Valiant, of Friendship, Me., standing out of Portland Harbor, bound for the gill-net herring-fishery at Wood Island, Maine. Three lower sails set; barrels on deck; dory in tow. Portland, Me., 1882. (Photo. No. 1866.) U. S. Fish Commission.

HERRING SCHOONER.

Schooner Ethel and Edith, of Brookline, Me., standing out of Portland Harbor, with all fittings on board for herring trip to Wood Island; dories stowed on deck; three lower sails and main gaff-topsail set. Portland, Me., 1882. (Photo. No. 1867.) U. S. Fish Commission.

HERRING SCHOONER.

Small herring schooner bound into port. Gloucester, Mass., 1882. (Photo. No. 2015.) U. S. Fish Commission.

FISHING SCHOONERS, GENERAL.

FISHING SCHOONERS ON MARINE RAILWAY.

View of marine railway at Parkhurst's Wharf, with schooners Mystic and Delia hauled out to be painted, &c. Gloucester, Mass., 1882. (Photo. No. 2090.) U. S. Fish Commission.

SCHOONER IN WEDDING RIG.

View of Harbor Cove from Rocky Neck. Vessel in Harbor Cove decorated with flags in celebration of the wedding of one of her crew. It is customary when one of a fishing schooner's crew

SCHOONER IN WEDDING RIG—Continued.

gets married to hoist all the flags obtainable in honor of the event, while the bridegroom is generally supposed to "wet the colors" by furnishing his shipmates with a liberal supply of whatever beverages they may prefer. Generally moderation is observed, but sometimes these occasions are celebrated in a very hilarious manner, and it is not uncommon for some members of the crew to get "gloriously drunk." Gloucester, Mass., 1882. (Photo. No. 2105.) U. S. Fish Commission.

OLD FISHING SCHOONER.

Old-fashioned, square-sterned fishing vessel, sailing off the wind. This style of schooner was built about 1845. At present many of them are employed in freighting, being too slow for fishing. Massachusetts Bay, 1882. (Photo. No. 1942.) U. S. Fish Commission.

19. SLOOPS.

FISHING SLOOP.

Sloop Leader, of Portland, Me. This vessel is engaged in flounder-fishing. The sloop is in the background, with fykes drying in her rigging, while in the foreground a man is engaged in mending a fyke. Portland, Me., 1882. (Photo. No. 1873.) U. S. Fish Commission.

FISHING SLOOP.

Sloop Target, of Portland, Me., with boats for tending fyke-nets alongside. The vessel is used as a home and packing-house. Portland, Me., 1882. (Photo. No. 1869.) U. S. Fish Commission.

HERRING SLOOP.

Herring sloop coming into port, with dories in tow. Gloucester, Mass., 1882. (Photo. No. 2014.) U. S. Fish Commission.

20. CUTTERS.

BOSTON MARKET CUTTER.

A market cutter such as are used by the Irish fishermen sailing from Boston, Mass. This style of boat, which is often called the "Dungarven build," is generally employed to a considerable extent in the herring gill-net fisheries in autumn, and the fishermen are seen engaged in picking their nets. Gloucester, Mass., 1882. (Photo. No. 2006.) U. S. Fish Commission.

BOSTON MARKET CUTTER.

Irish market boat, of Boston, Mass., under sail. Gloucester, Mass., 1882. (Photo. No. 2012.) U. S. Fish Commission.

21. QUODDY AND BLOCK ISLAND BOATS.

QUODDY BOAT.

Quoddy boat Millet Swett at anchor, with sails furled. Eastport, Me., 1882. (Photo. No. 1907.) U. S. Fish Commission.

QUODDY BOAT.

Quoddy boat (same as above) under mainsail and jib. Eastport, Me., 1882. (Photo. No. 1910.) U. S. Fish Commission.

SARDINE (QUODDY) BOAT.

View of a sardine boat discharging at Gillis's Wharf. Lubec, Me., 1882. (Photo. No. 1920.) U. S. Fish Commission.

FISHING BOAT.

View of an Eastport dock at low tide, showing the fishing boat Smuggler caught up by the nose. Eastport, Me., 1882. (Photo. No. 1927.) U. S. Fish Commission.

BLOCK ISLAND FISHING BOAT.

Crayon sketch (30 by 40 inches), showing the Block Island fishing boat in various positions. Drawn by H. W. Elliott and J. W. Collins. Washington, D. C., 1882. U. S. Fish Commission.

22. SEINE-BOATS.

FLEET OF SEINE-BOATS.

Mackerel purse-seine boats hauled up in winter quarters in the woods near Higgins & Gifford's boat shop; view from hill. Gloucester, Mass., 1882. (Photo. No. 2030.) U.S. Fish Commission.

SEINE-BOATS.

Seine-boats in winter quarters; view from road. Gloucester, Mass. 1882. (Photo. No. 2037.) U. S. Fish Commission.

PURSE-SEINE BOATS.

Seine-boat rowed by crew, with seine stowed; belonging to schooner E. W. Merchant, of Gloucester, Mass., Capt. Everett Clifford. Rockport, Mass., 1882. (Photo. No. 1831.) U. S. Fish Commission.

23. SHARPIES.

CONNECTICUT SHARPY.

A two-sail sharpy such as are used on the coast of Connecticut in the oyster and other fisheries. These are flat-bottomed, wide-sterned boats, with two leg-of-mutton sails. New Haven, Conn., 1882. U. S. Fish Commission.

24. DORIES.

DORY.

Fifteen-foot dory, with 21 men on board, weighing 3,362 pounds, or about 160 pounds each. Could carry 6 to 10 men more. Rockport, Mass., 1882. (Photo. No. 1828.) U. S. Fish Commission.

DORIES.

Dories anchored off Blubber Hollow, Rockport, Mass., 1882. (Photo. No. 1836.) U. S. Fish Commission.

FISHERMAN'S HAY-BOAT.

View of two dories on 'Squam River. The boats connected by platform and loaded with hay. Gloucester, Mass., 1882. (Photo. No. 1964.) U. S. Fish Commission.

SAIL DORY.

View of a dory sailing with two sails set. Gloucester, Mass., 1882. (Photo. No. 2023.) U. S. Fish Commission.

THE OLD AGE OF THE DORY.

An old dory, which has been condemned for fishing purposes, turned into a flower garden. Gloucester, Mass., 1882. (Photo. No. 2024.) U. S. Fish Commission.

AN OLD DORY.

Flower garden in an old dory, Staten street. Gloucester, Mass., 1882. (Photo. No. 2054.) U. S. Fish Commission. This novel use of an old fishing boat is common in Gloucester, where one may often see an old dory, that has outlived her usefulness at sea, covered with a mass of trailing vines and many-hued flowers, sitting in a fisherman's garden.

HOISTING A DORY.

View showing the crew hoisting a dory on board of schooner Isabel, of Greenport, Long Island, N. Y., 1882. (Photo. No. 2122.) U. S. Fish Commission.

DORIES.

Wagon-load of dories, with harbor in background. Gloucester, Mass., 1882. (Photo. No. 1971.) U. S. Fish Commission. Dories are hauled to the fish-wharves on jiggers in the manner shown in photograph.

25. BARK CANOES.

CANOES.

Indian birch-bark canoe under two sails. Eastport, Me., 1882. (Photo. No. 1908.) U. S. Fish Commission.

BIRCH-BARK CANOE.

Photograph (30 by 40 inches) of a birch-bark canoe, of Eastern Maine, being carried by two Indians of the Passamaquoddy tribe. Eastport, Me., 1882. (Photo. No. 1909.) U. S. Fish Commission.

BIRCH-BARK CANOE.

Sketch of a birch-bark canoe with two Indians in it engaged in fishing on a river. Drawn by L. Moeller. Washington, D. C., 1882. U. S. Fish Commission.

26. SKIN BOATS.

BIDARKA.

Sketch of a skin canoe such as are used by the natives of Alaska. Sketch shows a number of these boats with Aleuts in them engaged in catching codfish. Drawn by H. W. Elliott. Washington, D. C., 1883. U. S. Fish Commission.

27. DUG-OUTS.

CHINESE FISHING BOATS.

Sketch of a number of boats such as are used by the Chinese fishermen of California. Monterey, Cal., 1882. U. S. Fish Commission.

28. SHIP-YARDS, BOAT-SHOPS, ETC.

HAULING TIMBER, ESSEX.

Ox team, on the road at Essex, hauling logs to saw-mill to be made into plank for building fishing vessels. Essex, Mass., 1882. (Photo. No. 1960.) U. S. Fish Commission.

FISHING VESSEL BUILDING AT ESSEX.

Ship-yard of Willard A. Burnham. Fishing schooner (owned by J. F. Wonson & Co., East Gloucester) ready for launching. Laying the keel and ribs of a new vessel. Essex, Mass., 1882. (Photo. No. 1958.) U. S. Fish Commission.

SHIP-YARDS, ESSEX.

General view of vessels on the stocks at Essex. New schooner in the foreground, with shears erected for putting in masts. Essex, Mass., 1882. (Photo. No. 1959.) U. S. Fish Commission.

NEW FISHING SCHOONER FITTING OUT.

View of a new fishing schooner (the same that was photographed when just ready to launch at Essex) lying at the wharf of J. F. Wonson & Co., Gloucester, Mass., 1882. (Photo. No. 2084.) U. S. Fish Commission.

SPLICING THE CABLES.

Three men of the schooner Laura Sayward's crew splicing a manila cable on the wharf. The cables used on fishing vessels of New England are manufactured in lengths varying from 25 to 100 fathoms, and these are spliced together to obtain the length required. Gloucester, Mass., 1882. (Photo. No. 2033.) U. S. Fish Commission.

BOAT-BUILDERS' SHOP.

Boat-shop of Higgins & Gifford, builders of purse-seine boats, dories, &c. View from the wharf of Sayward Brothers, Gloucester, Mass., 1882. (Photo. No. 2031). U. S. Fish Commission.

C.—FITTINGS AND APPLIANCES FOR FISHING VESSELS AND BOATS.

29. Canvas used on fishing vessels.

CANVAS.

Samples of cotton canvas, showing the various grades used on fishing vessels. Exhibited by the Old Colony Mills, Plymouth, Mass.

CANVAS.

Samples of cotton canvas, showing the various grades used on fishing vessels. Exhibited by the Lawrence Mills Company.

CANVAS.

Samples of cotton canvas, showing the various grades manufactured for use on fishing vessels. Exhibited by the Russell Mills Company, Plymouth, Mass., N. Boynton & Co., agents, Boston, Mass.

CANVAS.

Samples of cotton canvas. Various grades used for sails on fishing vessels. Exhibited by the Woodbury Mills, Baltimore, Md.

30. Photographs of sail-loft and sail-maker's dwelling.

SAIL-LOFT.

Interior view of E. L. Rowe's sail-loft, with men at work making sails for fishing vessels. Gloucester, Mass., 1882. (Photo. No. 2091.) U. S. Fish Commission.

SAILMAKER'S HOUSE.

House of George D. Wharf, sailmaker, Prospect street, Gloucester, Mass., 1882. (Photo. No. 2052.) U. S. Fish Commission.

31. Cordage used on fishing vessels.

MANILA CABLE.

Hawser-laid, tarred. Circumference, 8½ inches; length, 100 fathoms. In coil as it comes from the factory. Exhibited by J. T. Donnell, Bath, Me. Style of hawser used on New England fishing vessels for anchoring on the banks. Schooners employed in cod and halibut fishing on the outer banks carry from 200 to 425 fathoms of cable, and invariably ride by one anchor on the fishing ground. The size varies with the tonnage of the vessels, but this size is carried by schooners ranging from 60 to 75 tons or more.

MANILA CABLE.

Hawser-laid, tarred. Circumference, 9 inches. Centennial collection, 1876. 54,704. Made by Sewall, Day & Co., Boston, Mass. Used on New England fishing vessels as an anchor cable. From 100 to 400 fathoms are taken by each vessel.

MANILA ROPE.

Shroud-laid, tarred. Six samples (Nos. 1 to 6), of 6 and 9 thread lines. Centennial collection, 1876. 54,706. Made by Sewall, Day & Co., Boston, Mass. Used on New England fishing vessels chiefly as seizings for serving larger ropes.

MANILA ROPE.

Shroud-laid. Fifteen samples (Nos. 1 to 15), measuring in circumference from $\frac{3}{4}$ inch to 6 inches. Numbers 9, 13, and 14 are four-strand with heart-center, the others are three-strand. Centennial collection, 1876. 54,707. Made by Sewall, Day & Co., Boston, Mass. Numbers 1 to 4 are used on fishing vessels for seizings and servings; numbers 5 to 11 for running-rigging, as halliards, sheets, clew-lines, and reef-points; numbers 12 to 15 for boom tackle, heavy sheets, tow-lines, and for net-swings in mackerel dragging.

HEMP ROPE.

Shroud-laid, tarred. Four sizes. (Nos. 1 to 4.) Circumference, from 4 to 7 inches. Centennial collection, 1876. 54,705. Made by Sewell, Day & Co., Boston, Mass. Used on New England fishing vessels for standing rigging, such as shrouds and stays. Many vessels use wire rope instead of hemp.

SAIL-TWINE.

White cotton sail-twine for sail-makers' use. Value, 1882, 20 cents per pound. 54,408. U. S. Fish Commission. Used for making and mending sails and for rigging fishing-gear.

BUOY-LINE.

Manila, 9-thread, one coil; weight, 42 pounds. Value, 1882, $17\frac{1}{2}$ cents per pound. U. S. Fish Commission. (S. D. & Co.) 54,410. Used for buoy-lines on halibut trawls, for warps to lobster traps, and for boat-anchor warps.

BUOY-LINE.

Manila, 6-thread; one coil; weight, $26\frac{1}{2}$ pounds. Value, 1882, $17\frac{1}{2}$ cents per pound. U. S. Fish Commission. (S. D. & Co.) 54,411. Commonly used for buoy-lines on cod, haddock, and halibut trawls.

SPUN-YARN.

Hemp, tarred (2-thread); one coil; weight, 4 pounds. Value, 1882, 12½ cents per pound. 54,401. U. S. Fish Commission. For bending anchors, seizing stays, rigging gear, &c.

SPUN-YARN.

Manila; one coil; weight, 12¼ pounds. Value, 1882, 17 cents per pound. 54,402. U. S. Fish Commission. For bending sails and anchors, rigging fishing gear, &c.

MARLINE.

Hemp, tarred; one coil; weight, 10 pounds. Value, 1882, 18 cents per pound. 54,403. U. S. Fish Commission. Used on fishing vessels for seizings, &c.

SAIL-TWINE.

White cotton sail-twine for sail-makers' use. Value, 1882, 20 cents per pound. 54,408. U. S. Fish Commission. Used for making and mending sails and for rigging fishing gear.

GANG OF STANDING RIGGING.

Model, scale 6 inches to foot. This gang of rigging, which is one-half the size used on New England fishing schooners of 80 tons, is chiefly of hemp, and includes jib and jumper stays, fore and main shrouds—the eyes of the rigging being fitted over false mast heads—triatic stay, topmast stays, &c. The manner of fitting fishing schooners' rigging is accurately shown. Exhibited by James M. Simms, Gloucester, Mass.

32. WINDLASSES AND CAPSTANS.

THE "PROVIDENCE" STEAM CAPSTAN-WINDLASS. (Model.)

Iron; worked by a system of interlocking cog-wheels and gearing, these being set in operation either by a capstan worked by hand or steam-power. Patented in the United States and Great Britain. Providence, R. I. 57,053. American Ship Windlass Company.

"The advantages of this style of windlass over our old steam windlass are: (1.) It can be set up in one-quarter the time and one-quarter the expense required when the engines are hung up to deck above. (2.) The engines being connected to the plate and all the parts of the windlass being tied together by the same plate, the whole must remain always in line; if the deck above twists or strains or is entirely crushed in or swept away, the windlass can be worked by steam as efficiently as before. (3.) The engines are more accessible, being at the right height and in the most convenient position possible—the engines, lock-

THE "PROVIDENCE" STEAM CAPSTAN-WINDLASS. (Model.)—Cont'd.

ing-gear of windlass, and friction-levers being all within reach. (4.) The windlass can be set up in the shop, and every part (including engines, friction-stands, deck-pipes, and bits) bolted to its place and marked, so that when set up on ship-board each part must come to its place without trouble or delay."

MODEL OF HAND-CAPSTAN OR WINDLASS.

Made with one double-acting lever and adapted for weighing anchors, hauling vessels from shores when stranded, setting up rigging, &c. Exhibited by Frederick S. Allen, Cuttyhunk, Mass.

MODEL OF CAPSTAN OR WINDLASS.

Has two levers and is especially adapted to fishing vessels. The power can be applied to two teeth of the ratchet at the same time by the links on the push pawls of the levers. Exhibited by Frederick S. Allen, Cuttyhunk, Mass.

MODEL OF HAND-CAPSTAN.

The brakes can always be hinged for action so that in the darkest night there need be no delay in revolving the capstan. The capstan is simple in construction and can be easily repaired. Exhibited by Frederick S. Allen, Cuttyhunk, Mass.

33. STEERERS.

RICHARDSON'S CHALLENGE STEERER.

This steering-wheel was patented May 30, 1882. It is used to a considerable extent on fishing vessels, and is said to be much in favor in New England. Exhibited by Nathan Richardson, Gloucester, Mass.

RUDDER-YOKE.

Made of brass, polished. Length, 14½ inches. Middletown, Conn. 57,552. Wilcox, Crittenden & Co.

34. COMPASSES, LOGS, ETC.

RITCHIE LIQUID COMPASS.

U. S. Fish Commission. 39,385. Compasses of this kind are now extensively used on fishing vessels from New England.

BRASS COMPASS.

Wooden box-case. Diameter of compass, 7¼ inches; box, 10 inches square and 7 inches deep. U. S. Fish Commission. 39,384. For use in rough weather.

BRASS DORY COMPASS.

Diameter, 3 inches; depth, 1⅝ inches. U. S. Fish Commission. 57,085. Carried on dories in foggy weather to enable the fishermen to find their vessels.

PATENT DOLPHIN SHIP'S LOG.

Brass, with dial; English make. Length, 18 inches; spread of fans, 6 inches. U. S. Fish Commission. 39,383. Used to ascertain the distance run by a vessel.

PATENT TAFFRAIL LOG.

Two sections, (1) the fan, which is towed astern of the vessel and is attached to the end of a line, the other end of which is fastened to (2) the indicator or register, that is secured to or near the taffrail. The advantage of this is that readings may be taken from the log without hauling it in, as must be done with all others. John Bliss & Co., New York.

"The following are some of the special advantages found in using the taffrail log: (1.) The dial of the log can be easily inspected at all times, which is particularly convenient when changing the course of the vessel, the necessity of hauling in being avoided. (2.) The rotator only being overboard and a smaller line used, the strain upon the line is about one-quarter of that of the submerged log, which is variously estimated at 40 or 50 pounds, sufficient to decrease the speed of the vessel to some extent; besides, the greater strain often causes the breakage of the line and the loss of the entire log. (3.) This log will be found, ultimately, the cheapest, because only the rotator is exposed to danger of loss, and when lost, can be replaced at trifling cost. (4.) The substantial manner in which these logs are made, and the fact that the registering apparatus is not exposed to the action of salt water, may be taken as a guarantee that they will last far longer than is possible with any submerged log. (5.) The liability of having the log ruined, or at least disabled, when crossing shoals, by striking the bottom, or being filled with sand, is avoided. (6.) The state of the log being readily seen, prevents the danger of overrunning a given distance when on any course. (7.) Fouling with sea-weed is avoided by the gradual taper of the blades, and the freedom from obstructions, such as knots or eyes. (8.) This log will indicate accurately at a lower speed than any submerged log, because there is less slip, owing to the spiral form of the blades of the rotator. (9.) The greater part of the damage caused by hauling in is avoided in this log, as that is so seldom required; besides, the blades, being spiral, are much stronger." (J. BLISS & Co.)

CHRONOMETER.

Used for ascertaining longitude. "This instrument [the chronometer] in its most perfect form has resulted from the demands of navigation, and upon its performance the safety of commerce in a large measure depends. As an instrument of precision it is entitled to the highest rank, and especially when it is considered that, unlike in the case of an astronomical clock, it is not almost daily compared with actual time observations to determine its error and rate, but on the contrary it is to be depended upon for weeks and even months, and the time observations are solely to find the local correction, and hence the longitude at sea. The method of construction has long been well established, and the only differences usually to be found in the work of different makers, beyond minor differences in the arrangement and size of the parts, are in respect to the adjustment for temperature. * * * It is usual for American manufacturers to import the *ébauche* from England, and the work performed by them consists in finishing up the parts of the train, and in making the adjustments for isochronism and temperature, upon which the time-keeping properties depend. Messrs. John Bliss & Co., however, exhibited chronometers which had been wholly constructed by them, and hence of strictly American manufacture throughout." (Extracts from Report of Prof. James C. Watson to the United States Centennial Commission, 1876.) John Bliss & Co., New York.

PARALLEL RULES.

Two sizes of Sigsbee's patent parallel rules. John Bliss & Co., New York. Used for shaping courses on charts.

"The principal advantages of this rule are as follows: (1.) Perfect ease of movement, due to the method of hinging the blades. (2.) The blades may be raised over thumb-tacks, creases or torn edges of charts; and are self-lifting when moved over the surfaces of uneven tables, reducing the probability of slipping. (3.) In projecting a course, if it be desired to examine for soundings or shoals that part of the chart covered by the rule, the movable blade may be thrown back for that purpose without shifting the other blade; or it may be stood on edge along the projected course, rendering pencil lines unnecessary. (4.) A slight pressure with the thumb and finger on the two rubber cushions of the fixed blade will prevent the rule from slipping. (5.) A parallel to the edge of a drawing board or block may be drawn by placing the blades at right angles to each other; one blade flat on the paper and the other flat against the edge of the board or block. (6.) The entire length of the inner edges of the blades may be used for ruling, without interference

PARALLEL RULES—Continued.

from the links, by throwing back the movable blade until it rests upon the hand which holds the fixed blade."

LEVER-CLOCK.

U. S. Fish Commission. 39,388. Used on fishing vessels.

QUADRANT.

Old style quadrant; large size, such as were in use 50 to 75 years ago. Gloucester, Mass., 1882. 54,332. A. R. Crittenden, Middletown, Conn.

QUADRANT.

U. S. Fish Commission. 39,391. Used for obtaining altitudes of the sun, moon, or stars, from which the position of a vessel can be determined when at sea.

SPY-GLASS.

Common telescope form. U. S. Fish Commission. 39,390. This is the style of spy-glass in most common use on fishing vessels.

HOLOSTERIC BAROMETER.

U. S. Fish Commission. 39,386. Carried on nearly all of the first-class fishing vessels.

35. BOOKS.

NAUTICAL ALMANAC FOR 1880.

U. S. Fish Commission. 39,389. Used on fishing vessels in ascertaining their position at sea.

BOWDITCH'S AMERICAN PRACTICAL NAVIGATOR.

Published by United States Bureau of Navigation. U. S. Fish Commission. 39,390. Used in navigating fishing vessels.

COAST PILOT.

Divisions A, B, and 14 of the Atlantic Coast Pilot. United States Coast and Geodetic Survey, J. E. Hilgard, Superintendent.

NAUTICAL ALMANAC.

American Ephemeris and Nautical Almanac. United States Department of the Navy; Bureau of Navigation, Nautical Almanac Office.

36. CHARTS USED BY FISHERMEN.

ELDRIDGE'S CHARTS AND COAST PILOT.

Exhibit of Eldridge's Charts and Coast Pilot, published by S. Thaxter & Son, Boston, Mass. "As a rule, the fishermen prefer to

ELDRIDGE'S CHARTS AND COAST PILOT—Continued.

carry these charts instead of those of the United States Coast Survey and Hydrographic Office. Charts 8 and 9 were prepared for the trade between New York, Cuba, and New Orleans, and are arranged so as to avoid the necessity and expense of using four charts, as formerly. These charts are printed on the best quality of linen paper, and mounted on cloth to make them durable.

"No. 1. *The Vineyard Sound and Nantucket Shoals*, on a very large scale, with a book of sailing directions. Persons using this chart will save the expense of employing a pilot. Price, $5.

"No. 2. *The Coast of North America*, from Cape Henry to Cape Sable, including the Chesapeake and Delaware Bays, and George's Shoals, on a large scale. Price, $4.

"No. 3. *Cape Cod to Belle Isle*, including the Bay of Fundy, Gulf of Saint Lawrence, and Banks of Newfoundland, with plans on a large scale of the coast of Nova Scotia, from Cape Canso to Pictou; the coast of Cape Breton, from Scatari to Sydney, and the harbors of Saint John's, Newfoundland, Saint John, New Brunswick, Halifax, and Miramichi. This is a new chart, prepared from the latest surveys, expressly for the coal and fishing trades. Price, $5.

"No. 4. *Boston Harbor*, on a large scale, with sailing directions. This chart affords a more practical guide to the various channels, passages, fishing-grounds, &c., of Boston Harbor, than any that has ever been issued. The bearings and distances of dangerous rocks and shoals, and the principal ranges of objects, are all given on the chart. Price, cloth, $1.

"No. 5. *A new chart of Long Island Sound*, from Newport to New York; with a book of sailing directions, containing a full description of the dangers to be avoided in entering the various harbors of the sound. Price, $5.

"No. 6. *Lynn to Halibut Point*, with the harbors of Salem, Beverly, Marblehead, Manchester, Gloucester, Rockport, and Annisquam; also the stone quarries at Folly Cove, Lanesville, Bay View, &c., on a large scale. Price, cloth, $1.

"No. 7. *Chesapeake Bay*, with the James, York, Rappahannock, and Potomac Rivers. This is a new chart, and the only one published which gives the rivers on a large scale on one sheet. Price, $3.50.

"No. 8. *Montauk Point to Saint Augustine*, with a plan of New York Bay and Harbor on a large scale. Price, $3.50.

"No. 9. *Saint Augustine to New Orleans*, with Florida Reefs, Bahama Banks, and entrance to Pensacola and Mobile Bays, on a large scale. Price, $3.50.

ELDRIDGE'S CHARTS AND COAST PILOT—Continued.

"No. 10. *Buzzard's Bay*, on a very large scale, with a book of sailing directions. Price, $3.

"No. 11. *New chart of Delaware Bay and River*, on a large scale, in one sheet. Eldridge's Coast Pilot, No. 1, Chatham to Saint John. Price $3."

CHARTS.

Charts of the Atlantic and Pacific coasts of North America. United States, Department of the Navy, Bureau of Navigation, Hydrographic Office.

CHARTS.

Collection of about one hundred and twelve charts published by the Survey, being charts of the Atlantic and Pacific coasts of North America. United States Coast and Geodetic Survey, J. E. Hilgard, Superintendent.

37. CABIN LAMPS, LANTERNS, TORCHES, ETC.

STARBOARD-SIDE LANTERN.

Tin, and cut green glass; the tin frame painted green; triangular; one glass side curved; the rest of tin. A swinging door is fitted in the after side, and a socket to fit on the lantern-board iron is on the third side. Triangular kerosene lamp inside. Boston, Mass., 1883. 57,180. U. S. Fish Commission. This is the style of side lantern commonly used on board of fishing vessels. This one is hung on the starboard lantern-board at night when the vessel is sailing, in order that the course she is pursuing may be easily determined by the crews of other vessels, and thereby a collision avoided which otherwise might occur.

"If two side lights you see ahead,
Port your helm and show your red.
Green to green, or red to red;
Perfect safety, go ahead."

PORT-SIDE LANTERN.

Tin, and cut red glass; the tin part painted red; triangular; one side of curved glass; the rest of tin. A swinging door is fitted in the after side, and a socket to fit on the lantern-board iron is on the third side. Triangular kerosene lamp inside. Boston, Mass., 1883. 57,179. U. S. Fish Commission. This colored lantern is hung on the port lantern-board at night when a vessel is sailing.

BOAT-LANTERNS.

Copper and glass; triangular; flat-bottom; convex top, with ventilator at apex; lamp inside with two burners; width of lantern

BOAT-LANTERNS—Continued.

at back 21 inches; each of the two sides 18 inches wide. Southern New England. 29,365. James H. Latham, Noank, Conn. Used in bow of boat in weequashing or spearing eels by night.

BOX SIGNAL-LANTERN (old style).

Square wooden frame, top and bottom; 4 panes of glass, 11 by 7½ inches, set on the side, one on each side. Door on one side swings on hinges; top of lantern has been repaired with tin when holes have been burned through. Dimensions, 16 inches high, 9 inches square. Rockport, Mass. Gift of J. W. B. Parsons. This was in use about 1830, a candle or oil-lamp furnishing the light.

FISHERMAN'S LANTERN.

Tubular; tin and glass. Height, 14 inches; diameter at base, 7 inches. Value (1882), $1. Gloucester, Mass., 1883. 54,382. U. S. Fish Commission. Used on fishing-vessels, especially those employed in the halibut and haddock fisheries, to hang around the deck or in the hold while "baiting-up," or stowing away the catch.

TUB-LAMP.

Tin lamp to hang on side of trawl-tub while "baiting-up" in the hold of a haddock vessel. Value (1882), 45 cents. Gloucester, Mass. 54,381. U. S. Fish Commission.

BINNACLE LAMP.

Copper; globular; hung in gimbals; fitted with kerosene burner; weighted with lead on the bottom to keep it upright. Gloucester, Mass., 1883. U. S. Fish Commission. Used on New England fishing-vessels to light up the compass at night.

CABIN LAMP.

Tin; fitted with kerosene burner; hung in gimbals. Gloucester, Mass., 1883. U. S. Fish Commission. Used in the cabins and forecastles of New England fishing-vessels.

FISHERMAN'S TORCH.

Tin; height, 9 inches; greatest diameter, 6½ inches. Fitted by fishermen to a staff about 6 feet long, and used about the deck while dressing mackerel at night. Gloucester, Mass., 1882. 54,384. U. S. Fish Commission.

FISHERMEN'S TIN CANDLESTICKS.

Gloucester, Mass., 1883. 54,416. U. S. Fish Commission.

CANDLESTICK.

Candlestick or "Sticking Tommy." Gloucester, Mass. 32,692. G. Brown Goode. Used in hold of vessel while storing fish.

38. LANTERN-BOARDS.

PORT SIDE-LANTERN BOARD.

Wood, painted red; projecting ends and lower side on after end; lantern iron, four holes in each end for lashings; length 4 feet, depth 11 inches, width of lower side 8 inches. Lantern iron, length 9 inches, width at base 6 inches, width of flange $1\frac{7}{8}$ inches. Gloucester, Mass., 1883. 57,850. U. S. Fish Commission. Used for hanging port side-lantern.

STARBOARD SIDE-LANTERN BOARD.

Wood, painted green; projecting end lower side, on after part; lantern iron attached, four holes in each end for lashings; length 4 feet, depth 11 inches, width (horizontally) 8 inches. Length of iron 9 inches, width of base 6 inches, width of flange $1\frac{7}{8}$ inches. Gloucester, Mass., 1883. 57,849. U. S. Fish Commission. Used for hanging starboard side-lantern, being lashed in starboard fore-rigging about 12 feet above deck.

39. FOG-HORNS.

COLLINS'S PATENT FOG-ALARM.

This invention consists of an upright cylindrical bellows of stout grain-leather, supported by and working upon three brass rods which are fastened at the lower ends to a strong wooden pedestal, and the upper ends of which are secured by means of screw-caps to a wooden top, to which also is attached the upper part of the bellows. This wooden top or cap-piece is surmounted by a brass cone having a hole in its apex into which is screwed a reed horn (either one of Nos. 56,956, 56,957, or 56,958 being used). The bellows is collapsed or distended by means of an iron lever working on a hinge attached to the wooden base. By moving this lever the air in the bellows is driven through the horn at the top with great force. A very heavy sound is obtained when either of the two large horns (Nos. 56,956 and 56,957) are used, while either of the small horns (No. 56,958) can be blown to its fullest capacity with very slight exertion on the part of the operator. Gloucester, Mass., 1883. 56,955. Capt. J. W. Collins. This implement was originally designed for use on fishing vessels, especially such as are employed in the trawl-line fishery. In the latter fishery the men go out in dories long distances (1 to 3 miles) from the schooners that are lying at anchor, and the prevalence on the banks of dense fogs

COLLINS'S PATENT FOG-ALARM—Continued.

in summer and snow in winter causes the loss of many fishermen, who go astray because they are unable to hear the horns which are ordinarily employed. The advantages of this fog-alarm are that it can be heard farther than any horn now in use on sailing vessels (this having been proved by actual test at sea); that the material of which it is made and the simplicity of its construction renders it less liable to get out of repair than other patent horns; that it may be at all times operated with comparatively slight physical exertion, and without any of the exhaustion that results from blowing a mouth-horn; and, finally, that it is adapted for use on all kinds and classes of vessels. Dimensions: Diameter of base 2 feet, thickness 4 inches; diameter of wooden top 19 inches, thickness, 1½ inches; diameter of bellows (56,955) 15 inches, height 20 inches; height of brass cone, 6½ inches; diameter of cone (at base), 9 inches; thickness of brass rods, five-eighths inches; length of lever 4 feet.

BRASS FOG-HORN.

Bell-mouth; fitted; large brass reed at small end. Length, 3½ feet; diameter of mouth, 6 inches. Gloucester, Mass., 1883. 56,956. Capt. J. W. Collins. Used on bellows No. 56,955.

NICKEL-PLATED FOG-HORN.

Tin, nickel-plated; bell-mouth; fitted with large brass reed. Length (exclusive of reed), 4 feet; diameter of mouth, 8 inches. Gloucester, Mass., 1883. 56,957. Capt. J. W. Collins. Used on bellows No. 56,955, and constitutes a portion of Collins's fog-alarm.

TIN FOG-HORNS.

Three horns, tin; ordinary mouth-horns, adapted for use on bellows No. 56,955. Length of each, 3 feet 2 inches; diameter of mouth, 5½ inches. Gloucester, Mass., 1883. 56,958. Capt. J. W. Collins.

FOG-HORN REEDS, ETC.

One large brass reed 3½ inches long, 1⅜ inches wide; 2 small reeds and mouth-pieces for small fog-horns. Gloucester, Mass., 1883. 56,959. Capt. J. W. Collins. To be used to replace other reeds which may be lost or injured.

THE ANDERSON FOG-HORN.

Tin; tubular; blown by hand. U.S. Fish Commission. 25,281.

PATENT FOG-HORN.

Tin; trombone shape; with wooden pusher. Length, 2 feet 8 inches. Gloucester, Mass., 1883. 57,807. U. S. Fish Commission. Not sufficiently powerful to be used on fishing-vessels.

SERIES OF COMMON REED FOG-HORNS. (Nos. 1, 2, 3, and 4.)

Tin; ordinary type of fog-horn, blown by the mouth. Middletown, Conn. 29,382. Wilcox, Crittenden & Co.

GRAND BANK FOG-HORN.

Called by the fishermen "lipper" or "ripper." Provincetown, Mass. 25,783. William H. Weston.

40. PRESERVATIVE FLUIDS AND PAINTS.

CANVAS AND ROPE PRESERVATIVE.

Nelson's patent preserving solution for canvas, ropes, and netting. Made by Chresten Nelsen. Gloucester, Mass., 1880. 32,801. "This solution is used to preserve canvas from injury by exposure to the weather, in any climate. Sails, &c., treated with the solution do not mildew or become stained in the least, but retain the appearance of new canvas after having been treated, and are as strong as when new."

PRESERVED CANVAS.

Piece of canvas showing the operation of Nelson's preserving solution. Chresten Nelsen, Gloucester, Mass., 1880. 32,802. "This piece of canvas was exposed to the weather, on damp ground, for six months, after half had been saturated with the preserving solution."

PRESERVED CANVAS.

Piece of canvas showing the operation of Nelson's preserving solution. Chresten Nelsen, Gloucester, Mass., 1880. 32,803. "This piece of canvas was exposed to the weather, on damp ground, for two seasons, after one-half had been thoroughly saturated with the preservative solution."

PRESERVED ROPE.

Piece of rope showing the action of Nelson's preservative on manila rope. Chresten Nelsen, Gloucester, Mass, 1883.

PRESERVED NETTING.

Pieces of netting showing the action of Nelson's preservative on netting. Chresten Nelsen, Gloucester, Mass., 1883.

PATENT COPPER PAINT.

Tarr & Wonson's copper paint for the bottoms of vessels. Tarr & Wonson, Gloucester, Mass. 39,430.

CAPE ANN COPPER PAINT.

Used on bottoms of fishing vessels to prevent the growth of barnacles and grass; also to keep the planks from being worm-eaten. James H. Tarr, Gloucester, Mass.

41. CHAFING-GEAR.

STRAD.

Made of three strands of manila rope, loosely braided and pointed at ends; 10 feet long. Gloucester, Mass, 1878. 32,696. Collected by Capt. J. W. Collins. Used on schooner's cable to prevent chafing in hawse-pipe and on stem. The strads are wound around the cable for a distance of 2 or 3 fathoms.

MAT FOR FLYING-JIBBOOM CAP.

Ponce mat, woven by hand, of tarred house-line; lines at corners for lashing mat in place. Length, 2 feet; width, 4 inches. Gloucester, Mass., 1883. 57,842. U. S. Fish Commission. Used on jibboom cap to prevent flying-jib and sheets from chafing on the iron cap.

MAT FOR PORT AFTER FORE-SWIFTER.

Ponce mat, made of tarred-hemp spun-yarn; tarred lines for rovings at corners. Length, 4 feet; width, 4 inches. Gloucester, Mass., 1883. 57,844. U. S. Fish Commission. Used on port after fore-swifter to prevent fore gaff from chafing the fore rigging.

MAT FOR STARBOARD AFTER FORE-SWIFTER.

Ponce mat, made by hand-weaving, of tarred-hemp spun-yarn; tarred lines or rovings at corners. Length, 4 feet; width, 4 inches. Gloucester, Mass., 1883. 57,843. U. S. Fish Commission. Used on the after fore-swifter on starboard side to prevent fore gaff from chafing the shroud.

MAT FOR FORE CROSS-TREES.

Canvas, to which are sewed manila thrums (short rope-yarns); 14 small brass grommets along the edges of canvas for roving-line to pass through. Length, 4 feet; width, center $6\frac{3}{4}$ inches, ends 4 inches. Gloucester, Mass., 1883. 57,836. U. S. Fish Commission. Used on after part of fore cross-trees to prevent fore-peak halyards from chafing.

FORE-BOOM BAND MAT.

Ponce mat of manila spun-yarn, thrummed with tarred manila yarns; tarred house-line at corners for tying mat in place.

FORE-BOOM BAND MAT—Continued.

Length, 2 feet; width, 5 inches. Gloucester, Mass., 1883. 57,841. U. S. Fish Commission. Used on fore-boom band to prevent foot of a foresail from chafing.

SWORD-MAT FOR PORT MAIN-RIGGING LANYARD.

Mat made of tarred house-line, rovings at ends. Length, 4 feet; width, 5 inches. Gloucester, Mass., 1883. 57,846. U. S. Fish Commission. Used on after main-rigging lanyard on port side to prevent lanyard from being chafed by boom-tackle, &c.

SWORD-MAT FOR STARBOARD MAIN-RIGGING LANYARD.

Sword-mat made (by weaving over a dagger-shaped piece of wood) of tarred-hemp house-line; tarred rovings at ends. Length, 4 feet; width, 5 inches. Gloucester, Mass., 1883. 57,845. U. S. Fish Commission. Used on after main-swifter lanyard on starboard side to prevent lanyard from being chafed by boom-tackle, &c.

MAT FOR PORT MAIN-SWIFTER.

Ponce mat; woven by hand of tarred hemp spun-yarn; rovings of house-line attached to corners. Length, 4 feet 2½ inches; width, 5½ inches. Gloucester, Mass., 1883. 57,848. U. S. Fish Commission. Used on port main-swifter to prevent main gaff from chafing the shroud.

MAT FOR STARBOARD MAIN-SWIFTER.

Ponce mat of tarred hemp spun-yarn; rovings of same attached to corners. Length, 4 feet 2½ inches; width, 5½ inches. Gloucester, Mass., 1883. 57,847. U. S. Fish Commission. Used on starboard main-swifter (7 to 8 feet below the cross-trees) to prevent the main gaff from chafing the shroud when the gaff is pressed out against the rigging.

CROSS-MAT FOR OUTRIGGER (port side).

Cross-shaped piece of canvas upon which are sewed manila thrums (short rope-yarns); 8 small grommets of brass along sides for roving to pass through. Length, 13 by 11 inches; width of end, 3½ inches. Gloucester, Mass., 1883. 57,838. U. S. Fish Commission. Lashed on end of port outrigger to main-topmast cross-tree to prevent chafing of sails, halyards, &c.

CROSS-MAT FOR OUTRIGGER (starboard side).

Cross-shaped piece of canvas, with manila thrums (short rope-yarns) sewed to it with stout twine; 8 brass grommets for roving to pass through. Length, 13 by 11 inches; width of ends, 4 inches.

CROSS-MAT FOR OUTRIGGER (starboard side)—Continued.

Gloucester, Mass., 1883. 57,839. U. S. Fish Commission. Lashed to end of starboard outrigger for main-topmast backstay to prevent chafing of mainsail, staysail, and gaff-topsail halyards, &c.

MAT FOR MAIN CROSS-TREES.

Canvas, to which are sewed manila thrums; 14 brass grommets along edges of canvas for roving-line to pass through. Length, 4 feet; width, center 7 inches, end 4 inches. Gloucester, Mass., 1883. 57,835. U. S. Fish Commission. Used on main cross-trees to prevent main-peak halyards from chafing.

MAT FOR MAIN-BOOM TOPPING-LIFT.

Ponce mat of manila spun-yarn, woven by hand and filled with manila thrums—bunches of short rope-yarns. Tarred house-line at corners for lashing. Length, 2 feet; width, 5 inches. Gloucester, Mass., 1883. 57,837. U. S. Fish Commission. Used on main-boom topping-lift to prevent the lift from being chafed by the main-peak block.

MAT FOR MAIN-BOOM BAND.

Bag rickal mat, made by weaving manila thrums (short rope-yarns) into two long pieces of manila spun-yarn, which are finally sewed together to form the mat. Length, $3\frac{1}{6}$ feet; width, $4\frac{1}{2}$ inches. Gloucester, Mass., 1883. 57,840. U. S. Fish Commission. This mat is fastened over the iron band in the slings of the main boom to prevent the band from chafing foot of mainsail.

42. BLOCKS, SHEAVES, AND DEAD-EYES.

PATENT TACKLE-BLOCKS.

Galvanized-iron shells and sheaves with steel pins; hooks and straps of wrought iron. Sizes 5, 7, 9, and 11 with single sheave; sizes 6, 8, 10, and 12 with double sheave. Loose hooks. Middletown, Conn. 54,702. Wilcox, Crittenden & Co.

TACKLE-BLOCKS.

Made of galvanized iron, with single eye. Series with single and double sheaves. Used largely by dory fishermen along the New England coast. Middletown, Conn. 25,152 and 54,704. Wilcox, Crittenden & Co.

TACKLE-BLOCKS.

Made of galvanized iron, with double eyes. Series with single and double sheaves. Middletown, Conn. 54,703–54,705. Wilcox, Crittenden & Co.

TACKLE-BLOCKS.

Made of galvanized iron; single sheave; one fixed and one swivel eye. Series of four sizes. Middletown, Conn. 54,707. Wilcox, Crittenden & Co.

TACKLE-BLOCK.

Made of galvanized iron. Single sheave, becket, swivel hook. Middletown, Conn. 54,708. Wilcox, Crittenden & Co.

TACKLE-BLOCK.

Made of galvanized iron. Single sheave, fixed becket and hook. Middletown, Conn. 54,709. Wilcox, Crittenden & Co.

PLAIN HOOK TACKLE-BLOCKS.

Wooden shell, double brass sheave, plain loose hook. Two sizes. Made by Walter Coleman & Sons. 25,816.

PLAIN HOOK TACKLE-BLOCKS.

Wooden shell, loose hook, double iron sheave. Two sizes. Made by Walter Coleman & Sons. 25,820.

PLAIN HOOK TACKLE-BLOCKS.

Wooden shell, loose hook, single iron sheave. Three sizes. Made by Walter Coleman & Sons. 25,821.

SISTER-HOOK TACKLE-BLOCK.

Wooden shell, single brass sheave, sister-hook, thimble in eye. Made by Walter Coleman & Sons. 25,817.

SISTER-HOOK TACKLE-BLOCK.

Wooden shell, single brass sheave, sister-hook, thimble in eye. Made by Walter Coleman & Sons. 25,819.

SISTER-HOOK TACKLE-BLOCK.

Wooden shell, double iron sheave, sister-hook, thimble in eye. Made by Walter Coleman & Sons. 25,818.

SWIVEL-EYE BLOCKS.

Made of galvanized iron. Series with single and double sheaves. Sometimes used on boats, but made chiefly for awnings. Middletown, Conn. 54,706 and 54,710. Wilcox, Crittenden & Co.

BULL'S-EYE BLOCKS.

Made of lignum-vitæ wood; two sizes. Used to secure the standing or fixed rigging to the hull of the vessel. Made by Walter Coleman & Sons. 25,805.

ROUND-BLOCK.

Wooden shell, single galvanized-iron sheave, no hook or eye, strap score. Used for jib-sheets on small craft. Made by Walter Coleman & Sons. 25,812.

JIB-SHEET BLOCK.

Made of galvanized-iron. Peculiar to Gloucester and Boston fishing vessels. Sizes 1 and 2. The first size is used on small vessels and the second size on large vessels. Middletown, Conn. 29,460. Wilcox, Crittenden & Co.

OUTRIGGER-BLOCK.

Iron, one sheave, swivel-hook. Total length, 9½ inches. Gloucester, Mass., 1883. 54,698. Capt. George Merchant, jr. Attached to mackerel-pocket outrigger, or boat-boom on mackerel schooner.

SNATCH-BLOCK FOR PURSE-SEINES.

Made of galvanized iron. Used on seine-boats for pursing mackerel and menhaden seines. Gift of Higgins & Gifford. 25,179.

SEINE-BLOCK.

Made of galvanized iron. In general use along the New England coast for pursing the mackerel seine. Varies slightly from the Higgins & Gifford or Cape Ann pattern, and meets with about the same favor. Middletown, Conn. 54,711. Wilcox, Crittenden & Co.

SEINE-BOAT BLOCK.

Made of galvanized iron. The first style of metallic seine-boat block used at Gloucester, Mass. Middletown, Conn. 29,462. Wilcox, Crittenden & Co.

HEART BLOCK.

Made of lignum-vitæ wood. Used to secure the standing or fixed rigging to the hull of the vessel. Made by Walter Coleman & Sons. 25,804.

IMPROVED SHEET-BLOCK WITH BOOM BUFFER COMBINED.

Has rubber cushions at its upper and lower ends, which are intended to ease off the strain when the boom jibes over suddenly. Intended to hang on the boom. Exhibited by Bagnall & Loud, Boston, Mass.

HARCOURT'S PATENT IMPROVED INSIDE IRON-STRAPPED BLOCK.

This improvement consists in having a solid partition in a double or triple block, and having four straps in a double and six in a triple block, each strap being let into each side of every partition. Exhibited by Bagnall & Loud, Boston, Mass.

IMPROVED SNATCH-BLOCK.

The outside straps are fastened at the end of the block by a bolt, which prevents the sides of the block from pinching the sheave. To lock and unlock the fastening is very easily accomplished by turning the block or hook to right angles, thus bringing the link even with the lip, which then is slipped off, the rope inserted, and the link replaced. This does away with the bolt and chain. Exhibited by Bagnall & Loud, Boston, Mass.

IMPROVED SEINE-BLOCK.

The improvement in this purse-seine block consists chiefly in having a lip to the slot where the purse-line is put in, and also in being provided with a lubricant that causes the sheave always to revolve easily. Exhibited by Bagnall & Loud, Boston, Mass.

SEINE-BLOCK. (Brown's patent.)

Made of galvanized iron. Used on seine-boats for pursing the mackerel seine. Middletown, Conn. 29,432. Wilcox, Crittenden & Co.

PURSE-SEINE BLOCK. (Merchant's patent, 1882.)

A galvanized-iron block, with single sheave, triangular shell, ridges on sides to prevent fouling. Gloucester, Mass., 1882. 54,322. Made by Wilcox, Crittenden & Co. Invented by Capt. George Merchant, jr., and intended to take the place of ordinary purse-rings at the foot of mackerel seines.

PATENT ROLLER SHEAVE.

Made of brass. Either the brass or iron roller sheave is much used in blocks. Made by Walter Coleman & Sons. 25,813.

IMPROVED LUG-ROLLER WITH IRON SHEAVE.

Exhibited by Bagnall & Loud, Boston, Mass.

SHEAVE-ROLLER BUSHING.

The rolls revolve on a sleeve or second pin, which in halyard blocks is one and one-half inches in diameter in place of three-quarter inch, thus giving a large bearing for the rolls to revolve on, the wear on the pin in the block being little, if any. Exhibited by Bagnall & Loud, Boston, Mass.

LUG-ROLLER BUSHING.

The washer, being flexible, will stay in its place until the rolls are entirely worn out, which is not the case with the old style of roller bushing. Bagnall & Loud, Boston, Mass.

DEAD-EYE.

Made of lignum-vitæ wood. Used to fasten standing-rigging to side of vessel. Made by Walter Coleman & Sons. 25,806.

43. Hoops and hanks.

MAST-HOOP.

Made of wood, and used to hold the sail to the mast. Gift of Walter Coleman & Sons. 25,807.

MAST-HOOP.

Wood, usually of hickory or white oak; ends bolted. Diameter, 25 inches; thickness, 1½ inches. Gloucester, Mass., 1883. 57,815. U. S. Fish Commission. This is the size of mast-hoop used on schooners of 75 or 80 tons. They slide up and down the masts, the luff of the sails being bent to the hoops.

MAST-HOOPS.

Made of galvanized iron. Series of sixteen sizes, 3 to 10 inches diameter. Used on small sail-boats in shore fisheries. Middletown, Conn. 25,159. Wilcox, Crittenden & Co.

RIDING-SAIL HOOP WITH BECKET ATTACHMENT.

Ordinary hickory mast-hoop with about one-third sawed out, leaving two ends separated about 17 inches. Iron hook fastened to each end of the hoop. Piece of luff of sail with becket; thimbles in ends of beckets. Diameter of hoop, 25 inches; wdith between hoops, 15¾ inches; length of becket ends, 1 foot. Gloucester, Mass., 1883. U. S. Fish Commission. Used for attaching riding sail to mainmast.

ADJUSTABLE JIB-HANK. (Clements' patent.)

Made of galvanized iron. Three sizes. Used for single stays. Middletown, Conn. 25,214. Wilcox, Crittenden & Co.

ADJUSTABLE JIB-HANK. (Clements' patent.)

Made of galvanized iron. Two samples. Self-adjusting. Used for double stays. Middletown, Conn. 25,215. Wilcox, Crittenden & Co.

JIB-HANKS.

For single stays. Made of galvanized iron. Series of thirteen sizes. This style of hank, half-round, was used from 1864 to 1875, but not now made. Middletown, Conn. 25,156. Wilcox, Crittenden & Co.

JIB-HANK. (Pratt's patent.)

Made of galvanized iron; two sizes. Used chiefly on yachts to ship and unship the jib easily and quickly. The hank is strung on the stay the same as the common jib-hank; the eye is seized on the luff-rope of the jib and hooked to the hanks whenever needed. Middletown, Conn. 25,158. Wilcox, Crittenden & Co.

JIB-HANKS.

For double stays. Made of galvanized iron. Series of eleven sizes. Middletown, Conn. 25,157 and 54,331. Wilcox, Crittenden & Co.

JIB-HANK.

Made of wood. Small size, for use on boats. Gift of Samuel Elwell, jr., Gloucester, Mass. 25,777.

JIB-HANK. (Beaman's patent).

Made of wood; used to hold the jib to the stay. Gift of Walter Coleman & Sons, 25,803.

JIB-HANK. (Beaman's patent.)

Made of galvanized iron. Middletown, Conn. 54,320. Wilcox, Crittenden & Co.

JIB-HANKS.

Made of galvanized-iron wire. Series of sizes from $\frac{3}{4}$ inch to $5\frac{1}{2}$ inches. Used by all vessels rigged with wire stays. Middletown, Conn. 54,330. Wilcox, Crittenden & Co.

JIB-HANK.

For double stays. Made of galvanized iron. Pattern in use from 1865 to 1875, but not now made. Middletown, Conn. 54,724. Wilcox, Crittenden & Co.

JIB-HANK.

Made of galvanized iron. The first style of iron jib-hank used on Connecticut River vessels. Middletown, Conn. 54,725. Wilcox, Crittenden & Co.

44. HOOKS, CLEWS, THIMBLES, AND GROMMETS.

HOOKS.

FISH-HOOK.

Galvanized iron; a barbless, hook-shaped implement, with blunt point, and eye and thimble at end of shank. Size of iron, $\frac{3}{4}$ inch; spread of hook, 5 inches. U. S. Fish Commission. 22,225. Used for lifting the flukes of anchors on a vessel's bow. For this purpose they are fitted with a rope from 9 to 12 feet long. Larger sizes are used on vessels above 50 tons.

DECK-HOOKS.

Made of galvanized wrought iron. Two sizes, one short and one long shank. Middletown, Conn. 25,194. Wilcox, Crittenden & Co.

MAST-HOOK CLUTCH. (Sawyer's patent.)

One pair, to be connected by a screw. Portland, Me. 29,449. Gift of E. A. Sawyer.

SWIVEL-HOOK.

Made of galvanized iron. Improved pattern for blocks and general use. Middletown, Conn. 29,444. Wilcox, Crittenden & Co.

EYE-HOOK.

Made of galvanized iron. Used in iron-strapped yacht-blocks. One sample, size ½ inch; made from ¼ inch to 1 inch. Middletown, Conn. 57,545. Wilcox, Crittenden & Co.

TACKLE-HOOKS.

Hooks and thimbles made of galvanized iron. Series of ten sizes, ¼ inch to 1 inch. (They are made up to 2½ inches.) Used by riggers on many parts of vessels and in rope-strapped blocks. Middletown, Conn. 25,155. Wilcox, Crittenden & Co.

MATCH-HOOKS AND THIMBLES.

Made of galvanized iron. Series of ten sizes, from ¼ inch to 1 inch. (They are made as large as 2 inches.) Used by riggers, and often called riggers' match or sister hooks. Middletown, Conn. 25,206. Wilcox, Crittenden & Co.

SAILMAKERS' SISTER-HOOKS.

Made of galvanized iron with wide spread. Series of ten sizes, ¼ inch to 1 inch. Used for jib-bonnet hooks and various other purposes. Middletown, Conn. 25,144. Wilcox, Crittenden & Co.

CAPE ANN BONNET-HOOKS.

Made of galvanized iron. Thimbles with wide mouth. Series of three sizes. Used in the luff of a jib to hook the bonnet on. Middletown, Conn. 25,145. Wilcox, Crittenden & Co.

BONNET-HOOK AND EYE.

Made of galvanized iron. Two sizes. Used to quickly remove or put the bonnet on the jib. Middletown, Conn. 29,452. Wilcox, Crittenden & Co.

PLATE-HOOK.

Made of galvanized iron. Used for hammocks and for various purposes about boats and vessels. Middletown, Conn. 25,185. Wilcox, Crittenden & Co.

GAFF-TOPSAIL SHEET-HOOK. (Henshaw patent.)

Made of galvanized iron. Used generally on Cape Cod vessels and on some Gloucester vessels. Middletown, Conn. 54,727. Wilcox, Crittenden & Co.

GAFF-TOPSAIL SHEET-HOOK. (Coleman patent.)

Made of galvanized iron. Used on all Gloucester fishing-vessels. Middletown, Conn. 54,728. Wilcox, Crittenden & Co.

TOW LINK AND HOOK.

Made of galvanized iron. Pattern used at Gloucester from 1873 to 1878 on seine-boats 28 to 30 feet long. Link, 12 inches long and 4 inches wide, with thimble at one end and hook 8 inches long at the other end. Middletown, Conn. 25,168. Wilcox, Crittenden & Co.

SEINE-BOAT TOW LINK AND HOOK. (Improved pattern, 1879 to 1882.)

Made of galvanized iron. Used on Cape Ann seine-boats. Total length, 21 inches; length of link, 13½ inches. Middletown, Conn. 54,742. Wilcox, Crittenden & Co.

HAMMOCK-HOOK.

Made of galvanized iron. Plate variety. Middletown, Conn. 25,195. Wilcox, Crittenden & Co.

SCREW-HOOKS.

Made of galvanized wrought iron. Series of seven sizes; used for hammocks and other purposes. Middletown, Conn. 54,750. Wilcox, Crittenden & Co.

CLEWS AND EARINGS.

SHIP-CLEWS.

Made of galvanized iron. Series of nine sizes. Used in pairs. They are thimbled in the clew-line bow for rope-strapped blocks. When iron-strapped blocks are used the clew-line is taken out and the block hooked in the bow. Middletown, Conn. 25,137 and 25,139. Wilcox, Crittenden & Co.

SHIP-CLEWS.

Made of galvanized iron. A bar for the clew line allows the clew-line block to lie snug to the sail. Much used on New Bedford whaling vessels but not liked by merchantmen. Middletown, Conn. 25,221 and 25,138. Wilcox, Crittenden & Co.

SPECTACLE OR FORE-AND-AFT CLEWS.

Made of galvanized wrought iron. Series of nine sizes. Used on all fore-and-aft rigged vessels and on upper top-sails of square-rigged vessels. Middletown, Conn. 25,135. Wilcox, Crittenden & Co.

HEART-CLEWS.

Made of galvanized iron. Series of six sizes. Used for clew of sails on any fore-and-aft rigged vessels. Middletown, Conn. 25,136 and 54,715. Wilcox, Crittenden & Co.

RING-CLEWS.

Made of galvanized iron. Complete set of clew irons for the mainsail of a 500-ton schooner. Includes the earing, tack, clew, and throat-ring clews. Middletown, Conn. 25,140–42 and 54,714. Wilcox, Crittenden & Co.

JIB-HEADS WITH CLEW-THIMBLES.

Made of galvanized iron. Two sizes. Used when the jib has stretched and gives too much hoist. The head of the jib is cut off and this iron attached. Middletown, Conn. 25,143. Wilcox, Crittenden & Co.

CENTER-TACK CLEW.

Made of galvanized iron. By a series of ropes running to the center of a square sail and attaching to this clew the sail is furled without the men going aloft. Middletown, Conn. 54,713. Wilcox, Crittenden & Co.

HEART-RING.

Made of galvanized iron. Pattern peculiar to the fishing vessels of Portland, Me. Used in the tack of a sail to prevent its puckering. Middletown, Conn. 54,716. Wilcox, Crittenden & Co.

TACK-RING CLEW.

Made of galvanized iron. Pattern peculiar to the fishing vessels of Gloucester, Mass. Used to prevent the puckering of a sail when the thimbles draw together. Middletown, Conn. 54,717. Wilcox, Crittenden & Co.

HEART-EARING CLEW.

Made of galvanized iron; two styles. Used on whaling vessels. Permits the leech of a sail to drop below the yard so as not to chafe the rope off. Middletown, Conn. 54,718–19. Wilcox, Crittenden & Co.

HEART-CHAIN EARING.

Made of galvanized iron. Middletown, Conn. 54,720. Wilcox, Crittenden & Co.

LINK EARING.

Made of galvanized iron. Middletown, Conn. 54,721. Wilcox, Crittenden & Co.

CLEW-BAR.

Made of galvanized iron. Navy pattern. Used on square-rigged vessels. Middletown, Conn. 54,712. Wilcox, Crittenden & Co.

THIMBLES.

SAIL-THIMBLES.

Made of heavy galvanized iron. Series of eighteen sizes—2 inches to 5 inches. Middletown, Conn. 25,129. Wilcox, Crittenden & Co.

SAIL-THIMBLES.

Made of heavy galvanized iron. Navy pattern. Used on United States naval vessels since 1858. Series of eight sizes. Middletown, Conn. 25,130. Wilcox, Crittenden & Co.

SAIL-THIMBLES.

Made of light galvanized iron. Series of fourteen sizes. Middletown, Conn. 25,131. Wilcox, Crittenden & Co.

LIP OR SADDLE THIMBLES.

Made of galvanized iron. Called also reef-tackle thimbles. Used in the leech of sails when the reef-tackle block hooks in. Series of five sizes—from $2\frac{1}{4}$ to $3\frac{1}{4}$ inches. Middletown, Conn. 25,133. Wilcox, Crittenden & Co.

SAIL-THIMBLES.

Made of brass, polished. Series of fourteen sizes. Middletown, Conn. 25,134. Wilcox, Crittenden & Co.

OPEN OR RIGGERS' THIMBLES.

Made of galvanized iron. Series of seventeen sizes. Middletown, Conn. 25,152. Wilcox, Crittenden & Co.

WIRE-ROPE THIMBLES.

Made of galvanized iron. Pattern of 1875. Series of ten sizes. Middletown, Conn. 25,153. Wilcox, Crittenden & Co.

WIRE-ROPE THIMBLES.

Made of galvanized iron. Series of fifteen sizes. Used on vessels with wire rigging. Middletown, Conn. 54,328. Wilcox, Crittenden & Co.

THROAT-THIMBLES.

Made of galvanized iron, with wide score. Series of four sizes—$2\frac{1}{4}$ inches to 3 inches. Used on Gloucester vessels in the throat of the sail instead of a clew, so that the sail will hug close to the gaff. Middletown, Conn. 25,312. Wilcox, Crittenden & Co.

WIRE-ROPE THIMBLES.

Made of galvanized iron. Series of fifteen sizes. Used on vessels with wire rigging. Middletown, Conn. 54,328. Wilcox, Crittenden & Co.

BLOCK BECKET AND THIMBLE.

Made of galvanized iron. Used in the Harcourt patent double iron-strapped blocks. Middletown, Conn. 54,726. Wilcox, Crittenden & Co.

RIDING-SAIL HOOK-THIMBLES.

Made of galvanized iron. One pair used on Gloucester fishing vessel to connect the mast hoop with the storm trysail or riding sail. Middletown, Conn. 54,729. Wilcox, Crittenden & Co.

GROMMETS.

IRON GROMMETS. (Wilcox's patent.)

Made of galvanized iron. One series loose and one inserted in canvas. Used on vessels in the Great Lakes. Middletown, Conn. 25,116. Wilcox, Crittenden & Co.

EYELET GROMMETS.

Made of brass. Eleven sizes. Used to line worked holes, also as coupling for Wilcox's patent grommet. Middletown, Conn. 25,124. Wilcox, Crittenden & Co.

BRASS GROMMETS. (Wilcox's patent.)

One series loose and one inserted in canvas. Middletown, Conn. 25,117. Wilcox, Crittenden & Co.

BRASS GROMMETS. (Patent, conical-pointed.)

One series loose and one inserted in canvas. Middletown, Conn. 25,118. Wilcox, Crittenden & Co.

BRASS GROMMETS.

Made of sheet brass, with washer. Series of four sizes, inserted and loose. The first kind of metallic grommet used in America. 25,119. Wilcox, Crittenden & Co.

BRASS GROMMETS.

Made of sheet brass, with teeth. Series of four sizes, inserted and loose. The first style of grommet patented in America. 25,120. Wilcox, Crittenden & Co.

BRASS GROMMETS.

Oblong shape. Series of five sizes. Specially designed for United States mail bags. 54,731. Wilcox, Crittenden & Co.

GROMMET RINGS.

Made of galvanized iron; one sample loose and one worked in canvas. 25,122. Wilcox, Crittenden & Co.

GROMMET RINGS.

Made of galvanized wire. Series of nineteen sizes. Middletown, Conn. 25,127. Wilcox, Crittenden & Co.

GROMMET RINGS.

Made of light galvanized iron wire. Series of seventeen sizes. Middletown, Conn. 25,128. Wilcox, Crittenden & Co.

GROMMET RINGS.

Made of galvanized iron. One ring inserted and lined with brass eyelet. Brass eyelet and ring loose. 54,732. Wilcox, Crittenden & Co.

BONNET-HOOK AND GROMMET.

Made of galvanized iron. The grommet is set in the foot of the jib, just above the foot rope. The hook is strung on the head rope of the bonnet when attached, and the jib and the latchet line serves through the eye on the back of the jib. By detaching one end of the latchet line the bonnet is unshipped at once. Middletown, Conn. 29,478. Wilcox, Crittenden & Co.

BUNTLINE HOLE AND GROMMET.

Galvanized iron grommet inserted. The hole is always round and open. Middletown, Conn. 54,735. Wilcox, Crittenden & Co.

ROPE-YARN GROMMETS.

Made of rope yarn. One sample loose and one inserted. 25,121. Wilcox, Crittenden & Co.

45. CHOCKS.

BOW-CHOCKS.

Made of galvanized iron; two samples, each seven inches long. Used on boats. Middletown, Conn. 25,216. Wilcox, Crittenden & Co.

CHOCKS.

Made of galvanized iron. This variety is usually made of brass and used by small yachts. Middletown, Conn. 54,743 Wilcox, Crittenden & Co.

CHOCKS.

Made of galvanized iron. Series of ten sizes, the smaller used on dories and the larger on Gloucester fishing vessels. Middletown, Conn. 54,745. Wilcox, Crittenden & Co.

BOW-CHOCKS.

Made of galvanized cast iron. Two pairs, for small boats. Middletown, Conn. 54,744. Wilcox, Crittenden & Co.

PATENT CHOCK FOR WHALE-BOAT.

Mayhew Adams, Chilmark, Mass.

46. BOAT-HOOKS.

BOAT-HOOKS, UNMOUNTED.

BOAT-HOOKS.

Made of galvanized wrought iron. Sharp points. Sizes 1, 2, and 3, unmounted. Middletown, Conn. 25,196. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized iron. Navy pattern; double ball-point variety. Two sizes, unmounted. Middletown, Conn. 25,197. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized malleable iron. Navy pattern; single ball-point variety. Sizes 2 and 3, unmounted. Middletown, Conn. 25,198. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized malleable iron. Sharp points. Sizes 2 and 3, unmounted. Middletown, Conn. 25,199. Wilcox, Crittenden & Co.

BOAT-HOOKS, MOUNTED.

BOAT-HOOKS.

Made of galvanized wrought iron. Sharp points. Mounted on poles. Middletown, Conn. 25,196. Wilcox, Crittenden & Co.

BOAT-HOOK.

Made of galvanized wrought iron. Sharp point. Size 0, mounted on pole. Middletown, Conn. 25,196. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized iron. Navy pattern; double ball-point variety; mounted on poles. Middletown, Conn. 25,197. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized iron. Navy pattern; ball points. Mounted on pole. Middletown, Conn. 25,198. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized malleable iron. Sharp points. Mounted on poles. Middletown, Conn. 25,199. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized malleable iron. Sharp points. Sizes 0 and 1, mounted on poles. Middletown, Conn. 25,199. Wilcox, Crittenden & Co.

BOAT-HOOKS.

Made of galvanized iron. Navy pattern; ball points; single hook; mounted on wooden pole. Middletown, Conn. 25,198. Wilcox, Crittenden & Co.

BOAT-HOOKS—ABORIGINAL.

BOAT-HOOK.

Staff of cedar, 1 inch in diameter, one end ornamented with notches, the other shod with an ivory hook carved in shape of a bird's beak, and lashed to staff with thongs of hide. Used in kyak for extracting articles from the forward and after ends of boat, and for the various purposes of ordinary boat-hook. Length, 2 feet 7 inches; hook, $1\frac{1}{2}$ inches long. Alaska, 1878. 36,020. Collected by E. W. Nelson.

BOAT-HOOK.

Wooden staff, $1\frac{1}{4}$ inches in diameter, oval in cross-section, shod at one end with a piece of pointed bone and at the other with a hook of bone, each lashed to staff with thongs of hide. Used in kyak or native boat, by Alaskan Indians, to ward off floating ice, &c. Length, 4 feet; length of bone, 5 inches. Alaska, 1878. 36,022. Collected by E. W. Nelson.

BOAT-HOOK.

Staff of cedar, $\frac{3}{4}$ inch in diameter, 3 feet 10 inches long, shod on upper end with bone hook lashed with thongs of hide. Used in native boat or kyak for extracting articles from forward and after ends of boat and for various purposes of ordinary boat-hook. Length, 3 feet 10 inches. Alaska, 1878. 36,023. Collected by E. W. Nelson.

BOAT-HOOK.

Wooden staff, $1\frac{1}{4}$ inches in diameter, armed at upper end with elaborately carved ivory tusk, triangular in cross-section, the upper end butting against the staff, and lashed in plane of stick with strips of hide. Part of outfit of a bidarka or native Alaskan boat from Goloona Bay. Alaska, 1880. 43,347. Collected by E. W. Nelson.

BOAT-HOOK.

Staff of wood, oval in cross-section, $1\frac{3}{4}$ inches in diameter, shod at one end with a piece of pointed bone 7 inches long and at

BOAT-HOOK—Continued.

the other with a hook of bone, each lashed to staff with thongs of hide. Carried in kyak or native boat by Alaskan Indians to ward off floating ice. Length, 5 feet. Alaska, 1882. 72,419. Collected by Chas. L. McKay.

EXTRACTOR.

Cedar staff, 1¼ inches in diameter, notched at one end, and shod at the other with a boat-shaped piece of carved bone lashed with strips of hide. Sledge Island. Used in kyak generally as a boat-hook, and to extract articles stowed forward and abaft the central opening, or cockpit, in which occupant sits. Length, 3 feet 9 inches. Alaska, 1878. 45,408. Collected by E. W. Nelson.

47. LEADERS AND LIZARDS.

BUNTLINE LEADERS.

Rope buntline hole and rope grommet, inserted and loose. Middletown, Conn. 25,123. Wilcox, Crittenden & Co.

BUNTLINE LEADER.

Made of galvanized iron. One sample loose and one inserted in canvas. Middletown, Conn. 54,733. Wilcox, Crittenden & Co.

BUNTLINE LEADER. (Wilcox's patent, improved.)

One sample loose and one inserted. A galvanized iron grommet-ring is first worked in, then the whole covered with the brass grommet. This is said to be the strongest and best buntline leader now used. Middletown, Conn. 54,734. Wilcox, Crittenden & Co.

LIZARDS OR BUNTLINE BULL'S-EYES.

Made of lignum-vitæ. Series of fifteen sizes. Used to secure standing rigging to the side of the vessel, and sometimes used as fair-leaders. Middletown, Conn. 25,151. Wilcox, Crittenden & Co.

FAIR-LEADERS AND BOOM FOOT-STOPS.

Series of three sizes; used by the smack fishermen of Newport, R. I. 25,604. Gift of J. M. K. Southwick.

FAIR-LEADER.

Used on the booms of Gloucester vessels. Gloucester, Mass. 29,450. Samuel Elwell, jr.

FAIR-LEADERS.

Made of brass, with sheaves. Series of three sizes. Middletown, Conn. 54,730. Wilcox, Crittenden & Co.

LACE TRUCKS.

Used on the foot of sail to attach it to the boom. Providence, R. I. 25,808. Walter Coleman & Sons.

LIZARD.

Used in connection with the luff of a sail and the mast hoops and hoisting-line. 29,446. Wilcox, Crittenden & Co.

LIZARDS OR BECKETS. (Sawyer's patent, two sizes.)

These are seized to the luff-rope of the sail, and the jack-rope, which connects the luff of the sail to the mast hoops, and passes through the thimbles. 29,447. Wilcox, Crittenden & Co.

LEADER FOR PEAK HALYARDS.

Used on the cross-trees. "A new and useful attachment." Improved sheet block with boom buffer combined.

48. PURREL TRUCKS.

PURREL TRUCKS.

Made of lignum-vitæ wood. Series of six sizes. Used on a rope around the mast to keep the gaff on the mast. Made by Walter Coleman & Sons. 25,802.

PURREL TRUCKS.

Made of lignum-vitæ wood. Two styles. Made by Walter Coleman & Sons. 25,943.

49. CLEATS AND BELAYING-PINS.

GAFF-TOPSAIL CLEAT AND DOWNHAUL ATTACHMENT. (Bagnall & Loud's patent, 1877.)

Made of galvanized iron. It is readily applied with one bolt to the gaff of vessels. This cleat swings to any position, overcoming the abrasion of the rope and side of the cleat, and by a downhaul attachment does away with the bull's-eye or block that was formerly fastened by a bolt driven into the end of the gaff. Middletown, Conn. 39,239. Wilcox, Crittenden & Co.

IMPROVED GAFF-TOPSAIL CLEAT AND DOWNHAUL ATTACHMENT.

"The advantages are first in a swinging cleat which will always have a fair lead, and can be applied either to the port or starboard side as well. In connection with the cleat is the band on the gaff and downhaul attachment, consisting of a brass bull's-eye, all being easily applied in one piece to the gaff by one bolt." Bagnall & Loud, Boston, Mass.

STAYSAIL AND SNATCH CLEAT.

Made of wood. Used on Gloucester fishing schooners. Made by Allan L. McDonald, Gloucester, Mass. 25,779.

BOAT-CLEATS.

Galvanized iron; two sizes. Length, 7 and 8 inches. Middletown, Conn. 57,036. Wilcox, Crittenden & Co. The large size is frequently used on seine-boats in place of the regular seine-boat cleat with plate. These are called the spike or rivet variety, because they are spiked or riveted on.

BOAT-CLEATS.

Galvanized iron; plate variety; two sizes. Length, $4\frac{1}{2}$ and $5\frac{1}{2}$ inches. Gloucester, Mass., 1883. 57,037. Wilcox, Crittenden & Co., Middletown, Conn. Used on fishing boats, &c., for fastening sheets and other ropes.

BOAT-CLEATS.

Made of galvanized iron. Plate pattern, or style used on seine boats. Sizes 1, 2, and 3. Middletown, Conn. 25,191. Wilcox, Crittenden & Co.

BOAT-CLEATS.

Made of galvanized iron. Old style, to bolt on. Sizes 4, 5, and 6. Middletown, Conn. 54,747. Wilcox, Crittenden & Co.

BOAT-CLEATS. (New pattern.)

Made of galvanized iron. Series of four sizes, 3, 4, 5, and 6. Middletown, Conn. 54,748. Wilcox, Crittenden & Co.

CLEATS.

Made of galvanized cast iron. Series of six sizes, the largest one being the smallest size used on fishing vessels measuring over 85 tons. Middletown, Conn. 54,746. Wilcox, Crittenden & Co.

CAPE ANN SEINE-BOAT CLEAT.

Made of galvanized iron. Middletown, Conn. 25,177. Wilcox, Crittenden & Co.

AWNING-CLEATS.

Made of galvanized iron, in shape of curved horn. Sizes 1, 2, 3, and 4. Middletown, Conn. 25,218. Wilcox, Crittenden & Co.

ROUND-BOTTOM AWNING-CLEATS.

Two sizes made of brass, and two of galvanized iron. Middletown, Conn. 25,217. Wilcox, Crittenden & Co.

CLEATS.

Made of wood. Two samples, small size. Made by Walter Coleman & Sons. 25,809.

IRON BELAYING-PINS.

Solid cast-iron. Middletown, Conn. 54,741. Wilcox, Crittenden & Co. Used in fastening ropes.

BELAYING-PINS.

Made of galvanized iron, hollow. The two smaller sizes are extensively used on Gloucester fishing vessels. Middletown, Conn. 25,161. Wilcox, Crittenden & Co.

BELAYING-PINS.

Made of galvanized iron, solid. Sizes 1, 2, and 3. Middletown, Conn. 54,741. Wilcox, Crittenden & Co.

STEM-CAP BELAYING-PINS.

Made of galvanized iron. Used on Cape Ann seine-boats to prevent the tow-link from rising off the stem-cap. Called by the fishermen "whistling-pin." Middletown, Conn. 25,169. Wilcox, Crittenden & Co.

BELAYING-PINS.

Made of wood; two sizes. Middletown, Conn. 25,766. Wilcox, Crittenden & Co.

50. ANCHORS AND GRAPNELS.

SNUG-STOW BOAT ANCHOR.

Galvanized iron; adjustable stock; flat shank. Length of shank, 21 inches; stock, 26 inches; spread of flukes, 15 inches. Middletown, Conn. 22,224. Presented by Wilcox, Crittenden & Co. Used chiefly for anchoring boats engaged in pleasure fishing.

BOAT ANCHOR.

Galvanized iron; short shank; adjustable stock, bent at one end. Length of shank, 20½ inches; stock, 18 inches; spread of flukes, 14½ inches. Presented by Wilcox, Crittenden & Co. 56,858. Used for anchoring fishing and pleasure boats.

BOAT ANCHOR.

Galvanized iron; adjustable stock, bent at one end. Length of shank, 17½ inches; stock, 16 inches; spread of flukes, 14½ inches. Presented by Wilcox, Crittenden & Co. 56,857.

BOAT ANCHOR.

Galvanized iron; adjustable stock, bent at one end. Shank, 16 inches long; stock, 15 inches long; spread of flukes, 13½ inches. Middletown, Conn. 25,162. Presented by Wilcox, Crittenden & Co. Used chiefly for anchoring boats engaged in pleasure fishing.

BOAT ANCHOR.

Double-end anchor; called also "Virgin Rocks," "double header," "end for end," "double flukes," "double dory-anchor." Iron; black; flukes at each end of shank, those on one end standing at right angles to those on the other. A ring on the shank slides freely to either end, and to this the anchor line is fastened. Length of shank, 30 inches; spread of flukes, 18 inches. Provincetown, Mass., 1882. 54,303. Presented by A. R. Crittenden, Middletown, Conn. Used by the Grand Bank hand-line cod fishermen on Virgin Rocks, where anchors frequently foul on the bottom. A ring in the shank slides back and forth, so that if one end fouls the fisherman can row in the opposite direction and the ring slides to the other head and generally throws the fouled end out. The Virgin Rock grappling is said to be better than the ordinary double-header.

VOSS'S IMPROVED SELF-STOCKING ANCHOR.

Galvanized iron. Length of shank, 2½ feet; spread of flukes, 13 inches; stock, 1 foot long each side of shank. East Gloucester, Mass. 39,421. D. C. Voss.

"This invention consists of a shank and flukes, similar to a common anchor; but its superiority consists in the folding of the stock, which is effected by means of a bar passing through the shank, to which the arms or parts of the stock are pivoted by bolts, the pivoted ends of the stock being so formed as to stop and support the arms at right angles to the shank, and while the folding stock enables you to stow or handle your anchor with ease, it does not prevent it from answering all the purposes of a common stock, as the draught of the cable on the shank cannot fail to bring it into position, nor can the cable get foul with the stock, as the pivot enables the stock to fall back, causing the turn of the cable to ship off. It is claimed that its advantages as a trawl anchor cannot be surpassed, as one can stow them anywhere in the dory and they are out of the way, besides the advantage of stowing them in the hold of the vessel (as six or eight of them can be stowed in the same space as one of the common anchors)."

TRAWL ANCHOR. (Small size.)

Galvanized iron. Length of shank, 18 inches; stock, 17 inches; spread of flukes, 10 inches. 56,856. Common type of anchor in general use among New England fishermen. Sizes used on trawls vary from 5 to 25 pounds.

TRAWL ANCHOR. (Common style.)

Iron; black; iron stock; ring parceled, and beckets of buoy-line bent to it. Length of shank, 3 feet; stock, 2 feet 8½ inches; spread of flukes, 16½ inches. Gloucester, Mass., 1883. 54,517. U. S. Fish Commission. Used for anchoring trawl-lines, boats, and nets.

MUSHROOM ANCHOR.

Black iron. It has no flukes, but a circular foot, formed of a wide band of iron attached to, and supported on, the ends of four stout arms which curve sharply upward from the crown. It has no stock, as the foot is always ready to take hold. Eye at top for rope to bend in. Length of shank, 4 feet 5 inches; diameter of foot, 2 feet 5 inches. Provincetown, Mass., 1879. 36,044. Collected by G. Brown Goode. Used by small vessels employed in catching mackerel with gill-nets.

DORY GRAPPLING.

Galvanized iron grappling, with 4 prongs; no stock; ring and thimble at top of shank. Length of shank, 17 inches; spread of prongs (point to point), 17 inches. Middletown, Conn. 25,163. Presented by Wilcox, Crittenden & Co. Used for anchoring dories on rocky bottom.

BOAT GRAPPLING.

Black iron; roughly made; four prongs, formed by two pieces of pointed square iron rods passing at right angles to each other through the shank near its lower end. No stock. Length of shank, 2½ feet; spread of flukes, 13½ inches. Provincetown, Mass., 1882. 54,304. Gift of A. R. Crittenden, Middletown, Conn. Used chiefly on Virgin Rocks, and on Rocky Bottom, Banquereau, for anchoring dories. The prongs being small and easily bent, the anchor can be pulled clear when caught beneath a rock.

GRAPPLING ANCHOR.

Galvanized iron; four prongs; no stock; ring in upper end of shank. Length, 19 inches; spread of prongs, 15½ inches. Middletown, Conn. 56,859. Made by Wilcox, Crittenden & Co. Used for anchoring nets or boats.

TWO-PRONGED GRAPPLING.

Galvanized iron; double shanks, united at top, where there is an eye and thimble; separated below with reversed prongs. Length, 2½ feet. Saint George's River, Maine. 22,223. Presented by Wilcox, Crittenden & Co. Used for boat and net anchor and also for dragging after lost cables, anchors, &c.

GRAPPLING ANCHOR.

Galvanized iron; four prongs braced at the bottom. Thimble in ring at top of shank. Length, 17½ inches; spread of prongs, 14½ inches. Presented by Wilcox, Crittenden & Co. 56,860. Used for anchoring nets, &c.

IRON KILLICK FOR SHORE COD-TRAWL.

An ordinary yoke-shaped killick, of blacked iron, with small piece of buoy-line attached. Length of shank, 13½ inches; flukes (point to point), 11 inches. U. S. Fish Commission. 54,538. Used for anchoring trawl-lines, &c.

IRON KILLICK.

Black; flat flukes; oblong piece of iron at right angles to flukes, held in place by shank of two pieces of twisted iron rod. Length of shank, 13 inches; flukes, 13½ inches (from point to point). Gloucester, Mass. 32,675. Presented by A. Voss. Used principally for anchoring trawl-lines.

IRON KILLICK.

Galvanized iron; flat flukes, with 8 inches spread; flat piece of iron fixed in the shank, which is double, being bent around the plate and fastened in the fluke like a yoke; thimble in top of shank. Length of iron weight, 8 inches; width, 3 inches; thickness, 1½ inches. Gloucester, Mass. 56,862. U. S. Fish Commission. Used for anchoring trawl-lines, nets, &c.

STONE KILLICK.

Rough, rectangular stone block fastened in a yoke, the arms of the yoke forming the flukes; rope strap fastened to arms. Rock 8½ by 6½ by 3 inches; sticks, 2 feet long; fluke piece, 1 foot long. Rockport, Mass., 1883. 54,417. U. S. Fish Commission. Used for anchoring boats, nets, and lines.

STONE KILLICK FOR HERRING-NET.

An oblong piece of rough granite, weighing about 60 pounds, fastened in a wooden and iron yoke, the iron part of which forms the flukes, and two sticks, the shank. Rock, 26 inches long, 7½ inches wide, 4 inches thick at bottom, 3 inches thick at top. Rockport, Mass., 1882. 54,548. U. S. Fish Commission. Used for anchoring gill-nets. Usually made by the fishermen and called the "poor man's anchor."

WOODEN KILLICK, OR COAST ANCHOR.

Wood and stone; shank of white oak, split at butt into 4 parts, these parts inclosing a stone, and fastening, at lower ends, into two flat pieces of hard wood which cross at right angles. Iron ferrule above split. Noank, Conn. 25,219. Presented by Capt. H. C. Chester. Used for anchoring fishing-gear, boats, &c. Sometimes called "poor man's anchor."

GRAPPLING-IRON.

Iron; black; four stout recurved hooks joined together on a single shank. Ring at top of shank served with canvas. Length of shank, 7 inches; spread of prongs, 8 inches. Gloucester, Mass. 25,936. Presented by A. McCurdy. Used to recover lost fishing lines, &c.

DEVIL'S-CLAW GRAPNEL.

Iron; black; a piece of $\frac{3}{8}$-inch chain, 10 or 12 feet long, with 3-prong, claw-like grapnels fastened at intervals of 3 feet along its length, and one at the extreme end of the chain. Length of each grapnel, 9 inches; each prong, 5 inches. Gloucester, Mass., 1883. 54,342. U. S. Fish Commission. Used for recovering lost trawl-lines, &c.

51. MAST-GEAR.

MAST-HEAD TRUCK.

Made of lignum-vitæ wood. Used on the topmast to display bunting and signals. Made by Walter Coleman & Sons. 25,810.

MAST-HEAD BALL.

Made of lignum-vitæ wood. Used on top of the topmast to display bunting and signals. Made by Walter Coleman & Sons. 25,811.

MAST-HEAD GEAR.

Made of galvanized iron. Used chiefly on dories at Provincetown, Mass. Gift of Amasa Taylor. 29,480.

MAST-GEAR.

Mast-head gear for dory. Provincetown, Mass. 29,480. Amasa Taylor.

MAST AND BOOM ATTACHMENT.

Used chiefly on dories at Provincetown, Mass. Gift of Amasa Taylor. 29,481.

WHALEBOAT MAST AND GAFF ATTACHMENT.

Made of brass. Used by Provincetown whalers. Middletown, Conn. 29,484. Wilcox, Crittenden & Co.

MAST-GEAR.

Six purrel trucks. Used on a rope around the mast to keep the gaff on the mast. Providence, R. I. Walter Coleman & Sons. 25,802.

MAST HINGE FOR WHALEBOAT.

Made of brass. Permits the mast to be easily raised or lowered. Middletown, Conn. 25,181. Wilcox, Crittenden & Co.

52. BOAT-BUILDERS' MATERIALS.

MISCELLANEOUS.

SOCKET FOR BOOM-REST OR CROTCH.

Made of galvanized iron. Used on the taffrail of fishing vessels when they are "lying to" on the Banks. Wellfleet, Mass. 29,482. Gift of Theodore Brown.

WATER DECK-IRON.

Made of galvanized iron. Fire-proof. Pipe opening 5 inches in diameter. These irons are made with openings from 4 inches to 10 inches in diameter. Sizes 4, 4½, 5, and 5½ are used on Gloucester fishing vessels. Middletown, Conn., 1882. 25,204. Wilcox, Crittenden & Co.

TOPSAIL TRAVELERS. (Patent.)

One pair; used on square-rigged vessels. Middletown, Conn. 29,463. Wilcox, Crittenden & Co.

ADJUSTABLE JACK-STAY LINK. (Clement's patent.)

Made of galvanized iron. Middletown, Conn. 54,722. Wilcox, Crittenden & Co.

ADJUSTABLE CONNECTING LINK. (Clement's patent.)

Made of galvanized iron. Middletown, Conn. 54,723. Wilcox, Crittenden & Co.

BOOM-TACKLE ATTACHMENT.

Made of brass. (Cruikshank's patent.) Middletown, Conn. 26,987. Wilcox, Crittenden & Co.

PLATE-RING.

Made of galvanized iron. Used on vessels for port-rings and other purposes. Middletown, Conn. 57,546. Wilcox, Crittenden & Co.

BURRS OR WASHERS.

Made of galvanized Swede's iron. Called also fore-locks. Series of twelve sizes. The large ones are used to lock ring-bolts,

BURRS OR WASHERS—Continued.

the small ones on various sized boat-rivets. Middletown, Conn. 25,223. Wilcox, Crittenden & Co.

GUNWALE SUPPORTER. (Old style.)

Made of galvanized iron. Used about 1874 on Cape Ann seine-boats. Middletown, Conn. 25,176. Wilcox, Crittenden & Co.

GUNWALE SUPPORTER. (Pattern of 1878.)

Made of galvanized iron. Used on Cape Ann seine-boats. Middletown, Conn. 57,544. Wilcox, Crittenden & Co.

STEM-CAP OR BUMPER.

Made of rubber. Used on stem of seine-boats. Middletown, Conn. 56,932. Wilcox, Crittenden & Co.

SEINE-BOAT STEM-CAP.

Made of galvanized malleable iron. Pattern used on Cape Ann seine-boats in 1874. Middletown, Conn. 25,178. Wilcox, Crittenden & Co.

SEINE-BOAT TOW-IRON.

Made of galvanized iron. Used on purse-seine boats all along the New England coast. Middletown, Conn. 25,167. Wilcox, Crittenden & Co.

TOW-LINE CHAFE-PLATES.

Made of galvanized iron. Used on gunwale of Cape Ann seine-boats at base of stem-cap, where the tow-line bears on and chafes the gunwale. Middletown, Conn. 54,310. Wilcox, Crittenden & Co.

SEINE-BOAT STEM-CAP WITH CHAFE-PLATES.

Made of galvanized iron. This is an improved pattern of stem-cap with gunwale chafe-plates joined to it, thereby making it do double duty, one piece taking the place of three pieces in old patterns. Middletown, Conn. 54,311. Wilcox, Crittenden & Co.

SEINE-BOAT BREAST-HOOK.

Made of galvanized iron. Used as a knee or brace on Cape Ann seine-boats. Middletown, Conn. 25,174. Wilcox, Crittenden & Co.

BREAST-HOOK AND STERN-KNEES.

Made of galvanized iron. Used in dories as breast-hook and right and left stern-braces. Middletown, Conn. 29,472. Wilcox, Crittenden & Co.

STERN-BRACE. (Pattern of January, 1883.)

Galvanized iron; shaped like a breast-hook. Used on bow of boat. Gloucester, Mass., 1883. 57,035. Wilcox, Crittenden & Co. Middletown, Conn.

Used on 40-feet seine-boats to strengthen the sterns. This was the first iron brace made of this pattern.

LONG DAVIT.

Made of galvanized steel. Used on Cape Ann seine-boats to hold the purse-blocks. Middletown, Conn. 54,315. Wilcox, Crittenden & Co.

DAVIT-IRON.

Made of galvanized iron. Used on Cape Ann seine-boats. The purse-blocks hook into it. Middletown, Conn. 25,166. Wilcox, Crittenden & Co.

DAVIT UPPER PLATE FOR THWART.

Made of galvanized iron. Used on Cape Ann seine-boats to prevent the splitting of the thwart when the seine is being pursed up and there is a great strain on the davit. Middletown, Conn. 54,314. Wilcox, Crittenden & Co.

DAVIT STEP-PLATE. (Improved pattern.)

Made of galvanized iron. Used on Cape Ann seine-boats. The socket goes through the thwart and prevents the plate from sliding or working loose. Middletown, Conn. 54,313. Wilcox, Crittenden & Co.

DAVIT-GUARD. (Improved pattern.)

Made of galvanized iron. Used on Cape Ann seine-boats for holding the purse-blocks. This pattern has a wider plate than the old style, takes more screws, and does not work loose as easily. Middletown, Conn. 54,312. Wilcox, Crittenden & Co.

DAVIT-GUARD AND STEP-PLATE.

Made of galvanized iron. Pattern of 1873 and 1875. Used on Cape Ann seine-boats. Middletown, Conn. 25,173. Wilcox, Crittenden & Co.

EYE-PLATES.

Made of galvanized iron; two sizes. Used on Cape Ann seine-boats for the oar-cranes or holders to swivel in; also used to hook the pursing-blocks into. Middletown, Conn. 25,175. Wilcox, Crittenden & Co.

OAR-HOLDER OR CRANE. (Old style.)

Used on Cape Ann seine-boats in 1870. Made of galvanized iron. Shank, 22 inches high, with projecting arm 12 inches high and 9 inches wide. Gloucester, Mass. 25,172. Gift of Higgins & Gifford.

OAR-HOLDERS OR CRANES.

Made of galvanized iron. One crooked or after crane, and one straight or forward crane. Used on Cape Ann seine-boats. Total height, 24 inches. Middletown, Conn. 25,171. Wilcox, Crittenden & Co.

BOAT-NAILS.

Made of galvanized iron; round head; chisel point. Series of twenty sizes. Middletown, Conn. 25,212. Wilcox, Crittenden & Co.

ROUND-HEAD BOAT-NAILS.

Made of galvanized Lake Superior iron. Series of twenty-one sizes. Middletown, Conn. 25,211. Wilcox, Crittenden & Co.

COUNTERSUNK BOAT-NAILS.

Made of galvanized Lake Superior iron, with screw heads. Series of twenty sizes. Middletown, Conn. 25,213. Wilcox, Crittenden & Co.

BOAT-RIVETS.

Made of galvanized iron, oval heads. Series of twenty sizes, $2\frac{1}{2}$ to $10\frac{1}{4}$ inches. Middletown, Conn. 25,220. Wilcox, Crittenden & Co.

COUNTERSUNK BOAT-RIVETS.

Made of galvanized iron, with screw heads. Series from $2\frac{1}{2}$ to $10\frac{1}{4}$ inches. Middletown, Conn. 25,220*a*. Wilcox, Crittenden & Co.

RING-BOLT.

Made of galvanized iron. Used on the bows of Cape Ann seine-boats for hoisting-in purposes. Middletown, Conn. 25,170. Wilcox, Crittenden & Co.

RING-BOLTS.

Made of galvanized wrought iron; to drive and rivet. Series of eight sizes. Used in all sorts of boats. Middletown, Conn. 25,203. Wilcox, Crittenden & Co.

SCREW RING-BOLTS.

Made of galvanized wrought iron. Series of eight sizes, from $\frac{1}{4}$ inch to $\frac{7}{8}$ inch. Used for various purposes about boats and vessels. Middletown, Conn. 25,202. Wilcox, Crittenden & Co.

SCREW EYE-BOLTS.

Made of galvanized wrought iron. Series of ten sizes, from $\frac{3}{16}$ inch to 1 inch. Used for various purposes about a vessel. Middletown, Conn. 25,201. Wilcox, Crittenden & Co.

SCREW EYE-BOLTS, OR BOOM FOOT-STOPS.

One series made of brass and one of galvanized iron. They screw into the boom, and the foot of the sail is laced to them. Used largely by Baltimore oystermen. Middletown, Conn. 25,604. Wilcox, Crittenden & Co.

SCREW EYE-BOLTS.

Made of galvanized iron. Split-eye variety. Series of four sizes. Middletown, Conn. 54,749. Wilcox, Crittenden & Co.

TOGGLE-POINT PUMP-BOLT.

Used extensively on Gloucester vessels. Middletown, Conn. 29,470. Wilcox, Crittenden & Co.

PUMP STANDARD.

Composed of pump-brake, standard, plate, socket, nut, and washer combined. Middletown, Conn. 54,739. Wilcox, Crittenden & Co. Used on Gloucester fishing schooners.

SMALL PUMP STANDARD.

Middletown, Conn. 54,740. Wilcox, Crittenden & Co.

ABORIGINAL IMPLEMENTS.

WEDGES.

Three wedges used in canoe building for splitting logs. Lengths, 16, 14, and 11 inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,679. James G. Swan. The log is first marked across the end with a sharp instrument. The small wedges are inserted and driven in carefully with a stone hammer. As soon as the slab begins to split, longer wedges are inserted on each side and carefully driven in. In this manner cedar boards 5 feet wide and 20 feet long are made.

WEDGE.

A wedge used in the manufacture of canoes. Length, 33 inches. Makah Indians, Neah Bay, Washington Territory, 1883. 72,678. James G. Swan. The top slab and one or two boards are first split from the log, and the remaining portion of the log is hewn into the shape of the canoe with the ax and adze.

STONE HAMMER.

An implement with a conical and a square-cut end used in canoe building for driving wedges. Length, 7½ inches. Makah Indians. Cape Flattery, 1883. 72,695. James G. Swan.

MAKAH HAMMER.

Stone hammer, resembling in appearance an ordinary pestle, with square-cut ends; used in canoe building and for domestic purposes. Length, 7 inches. Makah Indians, Cape Flattery, 1883. 72,680. James G. Swan.

These hammers "are made of the hardest jade that can be procured, and are wrought into shape by the slow drudgery of striking them with a smaller fragment, which knocks off a little bit at each blow. Months are consumed in the process, and it is one of their superstitions that from first to last no woman must touch the materials, nor the work be done except at night, when the maker can toil in solitude unnoticed by others. If a woman should handle the pestle, it would break, or if other persons should look on while the work was in progress, the stone would split or clip off. The night is preferred, because they imagine the stone is softer then than during the day. Any one can form an idea of the nature of this manufacture and its tedious labor by taking two nodules of flint or a couple of paving stones and attempting to reduce one of them to a required shape by striking them together. Yet these Indians not only fashion their hammers in this manner, but they make very nice jobs, and some that I have seen had quite a smooth surface, with a degree of polish. They are valued, according to the hardness of the stone, at from one to three blankets."—(*Indians of Cape Flattery. J. G. Swan.*)

WITHES.

Withes made from the long tapering limbs of cedar (*Thuja gigantea*) used in building and repairing canoes and for fastening the ends of the stretchers (thwarts). As the projecting stems and sterns cannot be cut from a log in one and the same piece with the canoe, they are carved separately and fastened on by means of withes. The end pieces being adjusted, holes are bored; the withes are soaked in water, and used in scarfing the two pieces of wood, the tapering ends acting upon the principle of a bristle or waxed end of a cobbler's thread. Wooden pegs are driven in to fasten the ends, and the work is strong and durable. Length, 18 inches. Makah Indians, Neah Bay, Washington Territory. 72,667. James G. Swan.

TRINKET MAKERS.

Short, rude steel or iron points in ends of bone or wood handles, secured by lashings of fiber or thongs or by wedges. Length: points, three-fourths to 1 inch; handles, 4 inches. Bristol Bay, Alaska, 1882. 55,923. Charles L. McKay.

RUDDER FIXTURES.

WHALE-BOAT RUDDER-BRACES.

Made of galvanized iron; one pair. Used on any whale-boat, but called Labrador pattern. Middletown, Conn. 25,182. Wilcox, Crittenden & Co.

RUDDER-BRACES. (Lewis Raymond pattern.)

Made of galvanized iron; one pair. Used on metallic life-boats. Middletown, Conn. 25,183. Wilcox, Crittenden & Co.

SPIKE RUDDER-BRACES.

Made of galvanized wrought iron. Called also drive rudder-braces. Series of six sizes. Middletown, Conn. 25,189. Wilcox, Crittenden & Co.

SCREW RUDDER-GUDGEONS.

Made of galvanized iron with screw and eye. Series of twelve sizes. Middletown, Conn. 25,190 and 57,543. Wilcox, Crittenden & Co.

RUDDER-BRACES.

Made of galvanized wrought iron. Series of six sizes. Middletown, Conn. 25,209. Wilcox, Crittenden & Co.

STRAP RUDDER-BRACES.

Made of galvanized iron. Series of six sizes. Used on sharp-stern boats; the three larger sizes on New Orleans boats engaged in the capture of catfish. Middletown, Conn. 25,210. Wilcox, Crittenden & Co.

RUDDER-BRACES.

Made of galvanized iron. La Chapelle variety, peculiar to Detroit River and vicinity. Middletown, Conn. 57,551. Wilcox, Crittenden & Co.

RUDDER FIXTURES.

"W. N. Clark's rudder-hanger." (Patented September 3, 1867.) Chester, Conn. 29,496. James B. Clarke.

"Advantages claimed for this hanger: To ship the rudder one has only to enter the tongue (which has the rudder already at-

RUDDER FIXTURES—Continued.

tached) in the grooved plate from the top just far enough to get it steady, and then let it down, when it will go to its place without further care. Hence arises the first great advantage which this hanger possesses over the old way, viz: the ease and dispatch with which the rudder can be shipped under all circumstances."

CENTER-BOARDS.

ATWOOD'S CENTER-BOARD.

Working model of Atwood's patent center-board for boats and canoes. Atwood Brothers, Clayton, N. Y.

BOAT-DETACHING APPARATUS.

WOOD'S BOAT ATTACHING AND DETACHING APPARATUS.

This is a non-automatic apparatus, being detached by one of the boat's crew. Invented and exhibited by Lieut. William M. Wood, U. S. N.

"When the crew, coxswain, and officer, if one is going, are in the boat, and after one of the stroke oarsmen has cast loose the lanyard, and handed it to the officer in charge, or the coxswain, the officer of the deck gives the order to 'lower away.' As soon as the boat is near enough the water, say about 2 feet, the person holding the end of the lanyard gives a quick jerk, and thus freeing the ends of the chain, they slack and allow the links to rise and the toggles to escape simultaneously. In case the ship is rolling heavily very little lowering will be necessary, as the boat can be detached as she rolls toward the water, and will be clear of the ship before the return roll. As soon as the boat is clear of the ship one of the stroke oarsmen brings the ends of the chain together, refastens the slip-hook and hitches the lanyard forward as a securing. The boat is then ready for 'hooking on' when she returns to the ship, after having completed her trip. When she comes alongside, the man in the bow gets the forward fall and sticks the toggle into the large part of the link and pushes it up beyond the tumbler. The man in the stern does the same, and as the falls are set taut on deck, they slue the turns out of the falls, the toggles acting as swivels. In fitting this apparatus in the boats of ships of war, it is deemed advisable to replace the two upper wood-screws by through-bolts. Also, in the bows of these boats, having the deep wooden breast-hook in the eyes, it will be better to bolt a piece of wood on to the apron of the stem, to set the link A out far enough to play up clear of the breast-hook. In boats with metallic breast-hooks this will not be necessary.

WOOD'S BOAT ATTACHING AND DETACHING APPARATUS—Continued.

"We now manufacture the roller B on a prolongation of the back plate of A, so that the apparatus is fastened in together. In case of a curvature in the apron of the stem or stern, this back piece can easily be bent to suit. We also have substituted chain for the wire rope, securing it at one end to the link by a shackle, so that, when it is placed in a boat, an excess of chain being always furnished, it can be taken up to the right length, cut off, and the shackle inserted in the proper link." (Extract from the instructions of Admiral William Reynolds, Chief of Bureau of Equipment and Recruiting, issued January 30, 1875, for guidance in handling boats fitted with the Wood apparatus.)

ROWLOCKS AND THOLE-PINS.

DAVIS'S STANDARD ROWLOCK.

"Twenty specimens of Davis' standard rowlocks, made in two patterns, with opening on back of bracket or front, as desired. Back opening always sent unless otherwise ordered. Made of three materials, galvanized, malleable iron, lacquered gun metal, or hard composition, and polished gun metal. Made in four sizes, $1\frac{3}{4}$ inches, 2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches in width between the narrow part of the horns. Frank E. Davis, Gloucester, Mass., exhibitor.

"The horns of these rowlocks are very wide, thus saving much wear to the oars. They are easily attached to the boat by screwing to the gunwale without cutting the rail, thereby strengthening instead of weakening it. They can be instantly turned down when not in use, leaving the rail as smooth and clear as if they were taken out. This is a great advantage in loading luggage, &c. They can be placed in position in a second, and thus are always ready for an emergency. The pattern with opening on back cannot be lost overboard, misplaced, or stolen, as they are securely locked in the socket when applied to the rail. They revolve in their sockets, which renders it almost impossible to trip the boat in a heavy sea. They are almost noiseless when in use, as they are nicely fitted. They are very strong and simple, as they are composed of but two pieces, and cannot get out of order. The pattern that has the opening on the front of bracket is specially designed for all cases where it is desirable to take the rowlock from the boat at any time, as in harbor boats, gunning floats, &c.

"The same general shape as described in the other pattern is retained, and the advantages there mentioned of durability, noiselessness, and manner of application are the same. In this pat-

DAVIS'S STANDARD ROWLOCK—Continued.

tern the fork may be taken from the bracket when desired by letting the fork part hang downward, then raising it vertically in that position, when it will readily slip out of the front opening. These may also be turned into position for use or dropped out of the way in the same quick manner. They also revolve in their sockets. By procuring extra brackets the rowlocks may be shifted from place to place on the rail."—[Davis.]

ACME OARLOCK. (Dowling Le Page patent, 1876.)

Made of galvanized iron. Series of 7 sizes, 0 to 6; height, 7 to 10 inches. Middletown, Conn. 22,227. Wilcox, Crittenden & Co.

SEINE-BOAT ROWLOCK.

Made of galvanized iron, with brass socket. Used on Cape Ann seine-boats. Height, 7 inches; opening of horns, 3 inches wide. Middletown, Conn. 25,085. Wilcox, Crittenden & Co.

WHALEBOAT ROWLOCK.

Made of galvanized iron, with brass socket. Height, 9 inches; opening of horns, 3½ inches wide. Middletown, Conn. 25,088. Wilcox, Crittenden & Co.

BRASS WASH-STREAK ROWLOCK.

Made of galvanized iron. They screw on the wash-streak of sail-boats. Middletown, Conn. 25,086. Wilcox, Crittenden & Co.

PATENT SWIVEL ROWLOCK.

Made of brass, polished, with swivel-plates. Series of three sizes, 3½, 4½, and 5 inches high. Middletown, Conn. 25,073–4–5. Wilcox, Crittenden & Co.

SWIVEL ROWLOCK. (Norcross patent, 1864.)

Made of galvanized iron. This was the first kind of swivel rowlock put on the market. Height, 5½ inches; opening of horns, 2¼ inches wide. Middletown, Conn. 25,101. Wilcox, Crittenden & Co.

PATENT SWIVEL ROWLOCKS.

Made of brass, unpolished. Socket screws on gunwale. Series of three sizes, 3½ to 4½ inches high. Middletown, Conn. 25,092–4. Wilcox, Crittenden & Co.

PATENT SWIVEL ROWLOCKS.

Made of galvanized iron. The swivel plate screws on the gunwale and does not weaken it as when holes are made for sockets.

PATENT SWIVEL ROWLOCKS—Continued.

Series of six sizes, from 3½ to 6 inches high, and with openings 2 to 3¼ inches wide. Middletown, Conn. 25,094–9. Wilcox, Crittenden & Co.

SOCKET ROWLOCKS.

Made of brass, unpolished. Series of three sizes; the smallest size has patent fastening at foot of shank. Middletown, Conn. 25,082–4. Wilcox, Crittenden & Co.

COMMON SOCKET ROWLOCKS.

Made of galvanized iron. Series of four sizes, from 4½ to 8 inches high. Middletown, Conn. 25,102–5. Wilcox, Crittenden & Co.

SOCKET ROWLOCKS.

Made of galvanized iron. Slim shanks or pintles. Used on gunning skiffs or any boats with very light gunwales. Two sizes, 5½ inches long; openings, 1¾ and 2 inches wide. Middletown, Conn. 57,547. Wilcox, Crittenden & Co.

SOCKET ROWLOCKS.

Made of brass, polished, with sockets. Series of three sizes, 5 to 6½ inches high. Middletown, Conn. 25,070–2. Wilcox, Crittenden & Co.

BECKET-OARLOCK AND SOCKET.

Made of galvanized iron. Pattern used on boats of United States revenue cutters. Height, 7½ inches; opening of horns, 2½ inches wide. Middletown, Conn. 25,109. Wilcox, Crittenden & Co.

BECKET ROWLOCK. (Norcross patent.)

Made of galvanized iron. The oarlock revolves on upright that is adjustable on a plate socket. Height, 5 inches; width, 8 inches. Middletown, Conn. 25,110. Wilcox, Crittenden & Co.

STEERING-OAR LOCK AND SOCKET.

Galvanized iron; latest pattern (January, 1883), for 40-foot Cape Ann seine-boat. This oarlock was the first one made, and was cast from a wooden pattern whittled out by a Gloucester fisherman. Length of steering-oar used with this lock, 18 feet. Gloucester, Mass., 1883. 57,033–4. Wilcox, Crittenden & Co., Middletown, Conn.

STEERING ROWLOCK AND STERN-BAND SOCKET. (Improved patterns.)

Made of galvanized iron. Used on Cape Ann seine-boats. This rowlock is much like the original pattern, except that the

STEERING ROWLOCK AND STERN-BAND SOCKET—Continued.

shank is altered in shape so as not to be liable to break, and the horns are wider so that the oar need not be drawn out so far on the blade to be unshipped. The stern-band socket is of improved pattern; it prevents splitting of the stern-post, and cannot be worked or wrenched loose. Middletown, Conn. 54,308–9. Wilcox, Crittenden & Co.

STEERING ROWLOCK WITH SOCKET.

Made of galvanized iron. Used on Cape Ann seine-boats. The small opening of the horns prevents rising of the oar. Height, 9½ inches. Middletown, Conn. 25,113. Wilcox, Crittenden & Co.

STEERING-OAR SOCKET.

Made of galvanized iron. Used on side of stern of Cape Ann seine-boat. Middletown, Conn. 25,114. Wilcox, Crittenden & Co.

MENHADEN SEINE-BOAT ROWLOCK.

Made of galvanized iron, with brass socket. Made specially for use of boats belonging to menhaden oil factory of Joseph Church & Co., Tiverton, R. I. Height, 8 inches; opening, 3½ inches wide. Middletown, Conn. 57,549. Wilcox, Crittenden & Co.

LYMAN'S PATENT BOW-FACING ROWING-GEAR. (William Lyman, patentee, Middlefield, Conn.)

This bow-facing, *i. e.*, front-view rowing-gear, is an invention which allows the rower to face forward instead of backward, pulling in the same mammer as with the ordinary oars. This reverse movement is obtained by having the oar in two parts, each part having a ball and socket joint, which is attached to the wale of the boat by means of a slot and button, and the two parts connected by a rod (with hinged bearings) which crosses the wale of the boat. U. S. Fish Commission. 26,902, 39,453. "Some of the advantages claimed by the inventor of this rowing-gear over the ordinary oar: (1.) The oarsman faces the direction in which he goes. This advantage of right position can be appreciated by conceiving how awkward it would be to drive or walk backward, which is the position of all oarsmen when using the old-style oars. (2.) The arrangement of the lever is such that the oarsman applies his strength to the best mechanical advantage, enabling him to row faster and more easily than with any other oar. (3.) During the stroke the

LYMAN'S PATENT BOW-FACING ROWING-GEAR—Continued.

stroke; secondly, to enable the outer end of the oar to be bow of the boat is slightly raised by the motion of the rower, instead of being lowered by his motion as in ordinary rowing. (4.) The stroke is longer than with ordinary oars. (5.) The oars can be instantly closed up out of the way along the side of the boat without detaching them from the gunwale, and by pressing up catch of the handle joint they can be folded inside the gunwale of the boat. (6.) It is better from the fact that the blade of the oar is in front, and can be seen at the beginning of the stroke, so there is no difficulty in avoiding obstacles, and there is no possibility of 'catching crabs.' (7.) With these oars the boatman makes no more effort in steering than in directing his course while walking, and this advantage lessens greatly the effort in rowing. (8.) The recovery, *i. e.*, return stroke of these oars, is very easy, so that any head wind upon the blade is hardly noticeable. (9.) While rowing there is no noise from the bearings. (10.) A pair of these oars weigh about 6 pounds more than the ordinary oars, but this additional weight has this advantage, that at the beginning and end of the stroke it helps to lower and raise the blade, owing to the peculiar position of the oar. (11.) When these oars are detached from the boat no wood or iron projections are left on the wale of the boat, as in ordinary rowing-gear, and thus a serious inconvenience is obviated. (12.) All danger of collision is avoided, and this advantage cannot be overestimated. One of the chief advantages of facing forward is that the oarsman can row with greater ease and safety in rough water. These oars can be attached to and detached from the boat very quickly, and they can be closed up in a convenient form for carrying. These several advantages, viz: the front view, the increased ease and speed in rowing, the raising of the bow instead of depressing it, the closing up of the oar out of the way while on the boat, the increased facility in avoiding obstacles, the diminished effort of hand and eyes in steering, the rowing without noise, the better balance and swing of the oars, have commended this new gear to all who have tried it."—(*Lyman.*)

NOISELESS ROWLOCK.

Frederick D. Graves's improved noiseless rowlock. Boston, Mass.

28,292. Frederick D. Graves. "The object of this invention is to improve the construction and operation of the class of rowlocks in such manner as, first, to insure the proper inclination of the blade of the oar, and prevent the liability of its catching the water when feathering in recovering, as well as to insure the proper position of the blade of the oar when making the

NOISELESS ROWLOCK—Continued.

raised when it is being feathered, in order to prevent its contact with the water in rough weather. My improved rowlock is composed of an inclosing ring located on a pintle, and an inner ring inclosed by the ring and adapted to be partially rotated therein; the inside of the inclosing ring is provided with a groove, which extends almost around it, its continuity being broken only by a stop. The pintle of the rowlock is inserted in a socket attached to the gunwale of the boat, the pintle and rowlock being adapted to turn freely in the socket. From the foregoing it will readily be seen that an oar pivoted in the inner ring is adapted to be partially rotated, in addition to its oscillating movements, so that when its stroke is completed it can be turned so as to feather the blade in the recover stroke. The stop and shoulders of the inner ring are arranged in such mutual relation that the shoulder abuts the stop, in feathering the oar, before the blade becomes horizontal in cross-section, so that the cross-section of the oar is unnecessarily inclined downward from its forward to its rear edge during the feathering stroke, this inclination of the blade preventing its forward edge from engaging with the water and overturning the rower, or, in other words, causing him to 'catch a crab.' This limitation of the oar in its rotation prevents awkward accidents in feathering, and enables an unskilled person to row with a considerable degree of certainty."—(*F. D. Graves.*)

EAST RIVER ROWLOCK.

Made of galvanized iron. Called also Blackburn's rowlock. It is made in one piece, 10 inches long and 3 inches high, and screws on the gunwale. Middletown, Conn. 25,089. Wilcox, Crittenden & Co.

NORTH RIVER ROWLOCK. (Albany pattern.)

Made of galvanized iron. Height, 5 inches. Middletown, Conn. 25,087. Wilcox, Crittenden & Co.

NORTH RIVER ROWLOCK. (Toledo pattern.)

Made of galvanized iron. A small rowlock with cross-pin and socket. Height, 5½ inches. Middletown, Conn. 57,548. Wilcox, Crittenden & Co.

WHITEHALL PATTERN ROWLOCK.

Made of galvanized iron, with socket. Called also East River rowlock, and used on Whitehall boats in vicinity of New York. Two sizes, 5½ inches high. Middletown, Conn. 25,115. Wilcox, Crittenden & Co.

COUNTERSUNK ROWLOCK.

Made of galvanized iron. Used on Ohio River flat-boats. Middletown, Conn. 25,111. Wilcox, Crittenden & Co.

LA CHAPELLE ROWLOCK.

Called also Lake Michigan rowlock. Made of galvanized iron. Used in vicinity of Detroit River. Middletown, Conn. 25,112. Wilcox, Crittenden & Co.

SAIL-BOAT ROWLOCK.

Made of galvanized iron, with socket. Middletown, Conn. 57,550. Wilcox, Crittenden & Co.

SIDE-PLATE ROWLOCKS.

Made of brass, polished. Used on gunning skiffs. Series of three sizes, 5½ to 6 inches high. Middletown, Conn. 25,076–8. Wilcox, Crittenden & Co.

SIDE-PLATE ROWLOCKS.

Made of brass, unpolished. Series of three sizes, 5½ to 6 inches high. Middletown, Conn. 25,079–81. Wilcox, Crittenden & Co.

SIDE-PLATE ROWLOCKS.

Made of galvanized iron. Series of three sizes, 5 to 6 inches long. Used on gunning skiffs with light gunwales. Delaware River model. Middletown, Conn. 25,106–8. Wilcox, Crittenden & Co.

SOCKET-JOINT ROWLOCKS.

Made of brass, polished. Frederick A. Gower, the maker, claims several advantages over ordinary rowlocks. "Wabbling of the oar is prevented, a good grip of the water is secured, it has superior strength, and is very compact." Height, 5½ inches. Middletown, Conn. 29,319. Wilcox Crittenden & Co.

ROUND SOCKET ROWLOCK. (Newport and Providence River pattern.)

Made of galvanized iron. Height, 5¾ inches; opening for oar, 2½ inches diameter. Middletown, Conn. 29,459. Wilcox, Crittenden & Co.

PATENT ROWLOCKS.

Made of brass, polished. Series of five varieties of ball-and-socket rowlocks invented by Israel Mayo, of Gloucester, Mass. Middletown, Conn. 57,544. Wilcox, Crittenden & Co.

DORY ROWLOCK.

Made of gun-metal, with socket. Southwick's patent fastening at foot of shank to prevent slipping. Middletown, Conn. 25,090. Wilcox, Crittenden & Co.

DORY ROWLOCK.

Made of galvanized iron, with socket. Southwick's patent fastening at foot of shank to prevent slipping. Middletown, Conn. 25,100. Wilcox, Crittenden & Co.

DORY ROWLOCK.

Made of galvanized iron, with socket. A small piece of wood attached to a piece of string fastened in foot of shank shows common method used to prevent the rowlock slipping out and overboard. This is the common size of socket rowlock used in New England dories. Middletown, Conn. 25,188. Wilcox, Crittenden & Co.

THOLE-PIN OARLOCK.

Made of galvanized iron. One pair. Pattern used on Louis Raymond's patent metallic life-boats, and other metallic life-boats for ocean steamers. Middletown, Conn. 25,184. Wilcox, Crittenden & Co.

THOLE-PIN OARLOCK PLATES.

Made of galvanized iron. Series of three sizes. 8 to 9 inches long. They screw on the gunwale and prevent its wearing or chafing away. Middletown, Conn. 57,553. Wilcox, Crittenden & Co.

DORY THOLE-PINS.

Made of oak. Bunch of one dozen pins as sold to the fishermen. Middletown, Conn. 54,488. Wilcox, Crittenden & Co.

53. DRAGS, OR FLOATING SEA ANCHORS.

COLLINS'S IMPROVED ADJUSTABLE MARINE DRAG.

Full size for fishing vessels. It consists of a strong iron hoop, jointed and braced so that it can be folded and stowed away in small compass when not in use. To this is attached by interlocking hooks a heavy canvas bag, which will fill with water when thrown overboard and hold the vessel steady, nearly head to the sea and wind, and with only a moderate leeway. The drag, when in use, is secured to a hawser by a chain bridle, and can be suspended at any required depth by means of a buoy. A line is attached to the bottom of the bag so that it can be tripped and easily hauled in when its use is no longer necessary. The advantages of this drag are that it is always ready for use, being easily adjusted in a few moments when needed; that it can be unrigged and stowed away when not in use; that it can be constructed at a moderate cost; and that it promises to secure the desired end much better than

COLLINS'S IMPROVED ADJUSTABLE MARINE DRAG—Continued.

the drags ordinarily employed for the same purpose. Dimensions: Circumference of hoop, 18 feet; length of cross-bars, 5 feet 10½ inches; size of iron, 1¼ inches; length of bridle-chains (each), 5 feet; circumference of bag, 19 feet; depth of bag, 4 feet; canvas (No. 0), white cotton duck; buoy, 7-gallon keg; buoy-line, 10 fathoms long; tripping-line, 25 fathoms long. Gloucester, Mass., 1883. 57,015. Capt. J. W. Collins. This drag is used to insure the greater safety of vessels in heavy gales, and also to prevent them from drifting so rapidly to leeward as they usually do when it is not employed. It is secured to a hawser or chain and paid out from the bow of a schooner, the distance varying from 25 to 75 fathoms.

COLLINS'S ADJUSTABLE MARINE DRAG (model, scale of one-third).

Gloucester, Mass. 39,488. Capt. J. W. Collins. Used by vessels "lying to" in a storm.

54. SCRAPERS AND DECK-SCRUBS.

IMPROVED SHIP'S DECK-SCRAPER.

Triangular, concave, steel head, fastened by means of a screw to an iron socket into which the wooden handle fits. Length of the sides of head 4¾ inches, handle 18 inches. Middletown, Conn. 54,325. Wilcox, Crittenden & Co. Used for scraping the pitch from a vessel's deck and the outside of the hull. The peculiar form of the head of this scraper renders it better for the work.

DECK-SCRAPERS.

Series of ships' deck-scrapers. Middletown, Conn. 25,160. Wilcox, Crittenden & Co.

SQUILLGEE.

Consists of head and handle. Head flat piece of wood, into one edge of which is fastened, in a groove, a strip of rubber; handle of wood; length of head, 15 inches; width, 3½ inches; length of handle, 4 feet. Gloucester, Mass., 1883. 57,811. U. S. Fish Commission. Used for cleaning decks, floors of packing-houses, &c.

DECK-SCRUBBING BROOM.

Rough oak sapling, with one end stripped in fibers or slivers, to form the broom. These fibers are tied together with a piece of marline. Length 40 inches. Gloucester, Mass., 1883. 57,813. U. S. Fish Commission. Used for scrubbing decks, ice-houses, &c.

BIRCH SCRUB-BROOM.

Made of a birch sapling; the butt being stripped into fibers to form the broom. Gloucester, Mass., 1880. 39,194. U. S. Fish Commission. Used to scrub decks, &c., on fishing-vessels.

CABIN AND DECK BROOM.

Corn-straw broom, attached by wire to cypress-wood handle. Gloucester, Mass., 1883. 57,814. U. S. Fish Commission. Used for sweeping cabin and deck.

55. SCOOPS AND BAILERS.

DORY SCOOP.

Carved out of one piece of wood; painted light brown; shovel-shaped bowl; round, straight handle. Length of bowl, 8 inches; width, 6 inches; handle, $3\frac{3}{4}$ inches long. Gloucester, Mass., 1876. 25,222. S. Elwell, jr. For bailing out dories.

DORY SCOOP.

Carved out of single block of wood; painted blue; shovel-shaped bowl, with projecting slightly curved handle. Length, $8\frac{1}{2}$ inches; width, $7\frac{1}{2}$ inches; handle, $3\frac{3}{4}$ inches long. Provincetown, Mass., 1876. 25,707. Central Wharf Company, Provincetown. Used by fishermen for bailing out dories.

DORY SCOOP.

Wood, painted; shovel-shaped; round, projecting handle. Length, 8 inches; width, 7 inches; handle, $3\frac{3}{4}$ inches long. Gloucester, Mass., 1880. 57,048. U. S. Fish Commission. Used for bailing out dories.

FISHERMAN'S HOME-MADE DORY SCOOP.

Wooden sides and handle; zinc bottom. Length of scoop, 9 inches; width, $8\frac{1}{4}$ inches; length of handle, $3\frac{3}{4}$ inches. Gloucester, Mass., 1883. 57,818. U. S. Fish Commission. This is the kind of large scoops made by the fishermen themselves for use in winter, when smaller scoops are of no avail.

WOODEN SCOOP.

Hard wood; a spoon-shaped bowl, with projecting handle; a hole cut in the latter to admit the hand. Length of bowl, 9 inches; average width $7\frac{1}{2}$ inches; handle, 5 inches long. Northwest coast of America. 690. George Gibbs. Used for bailing out canoes.

WOODEN SCOOP.

Hard wood, carved out of single block; spoon-shaped bowl, with slot in handle; a line of red paint around the inner upper edge.

WOODEN SCOOP—Continued.

Length of bowl, 10 inches; average width, 6½ inches; handle, 3¾ inches long. Port Townsend, Washington Territory. 13,104. James G. Swan. Used for bailing out canoes by Haidah Indians, Queen Charlotte Islands.

56. SHOVELS.

ASH AND COAL SHOVEL.

Galvanized iron, projecting handle, with eye at end. Total length (handle included), 13 inches; width of blade 5 inches. Gloucester, Mass., 1882. 54,329. Wilcox, Crittenden & Co., Middletown, Conn. Used for removing ashes from stove and for filling stove with coal, &c.

57. PUMPS AND BUNG-BUCKETS.

RUSSELL'S FOUNTAIN PUMP.

Iron, with iron boxes, worked by hand with lever; mounted on wooden box to show it in operation. Dimensions of pump: Height, 11 inches; including apparatus for working it, 14 inches; diameter, 16 inches; projecting lip or spout, 5 by 9 inches; handle, 2½ feet long. Newburyport, Mass., 1883. Albert Russell & Sons. This style of pump is now extensively used on the modern-built fishing vessels of New England, and is found much more powerful and easier to work than the wooden pumps formerly carried.

HAND WATER-PUMP.

Hard wood, tubular, small cylinder-shaped nozel 5 inches from top. Wooden box connected by wire rod to wooden handle at top. Length, 3¾ feet; diameter, at lower end 1¾ inches, upper end 3 inches. Gloucester, Mass., 1883. 57,047. U. S. Fish Commission. Used for pumping fresh water from tanks, casks, or barrels.

SEINE-BOAT PUMP.

Wooden cylinder, with projecting, tubular-shaped wooden spout, inserted in round hole below top of pump, and standing at right angles with the latter. Galvanized-iron rod and pump-box. Length of pump, 4 feet; diameter, 6½ inches; spout, 3 feet 10 inches long; diameter, 4 inches. Gloucester, Mass., 1883. 57,046. U. S. Fish Commission. Used for pumping water out of purse-seine boats. The pump is usually fixed in the after part of the boat.

BUNG-BUCKET OR WATER-THIEF.

Tin; tubular; closed at bottom and open at top. Provincetown, Mass. 25,784. Wm. H. H. Weston. Used instead of a pump for drawing drinking-water from the bung-hole of a cask. More common on large than on small vessels.

58. FIDS, MARLINE-SPIKES, AND SPLICERS.

SPLICING-FID.

Hard wood, round, and painted. Length 28 inches, diameter of thickest end 4 inches. Gloucester, Mass., 1883. 57,817. U. S. Fish Commission. Used for splicing cables.

IMPROVISED SPLICING-FID.

Hard wood, pointed at one end; rope strap through the upper or larger part 3½ inches from the end. Length of fid 18 inches; diameter at butt end 5 inches. U. S. Fish Commission. Made by fishermen on board of their vessel. Used for opening the strands of a cable when it is being spliced.

HAND FIDS.

Series of hickory hand fids. 25,146. Wilcox, Crittenden & Co., Middletown, Conn. Used chiefly by sailmakers.

MARLINE-SPIKE.

Sailmakers' marline-spike. 25,147. Wilcox, Crittenden & Co., Middletown, Conn. Used in making sails.

MARLINE-SPIKES.

Series of marline-spikes. 25,164. Wilcox, Crittenden & Co., Middletown, Conn.

BONE MARLINE-SPIKE.

Made from the jawbone of whale. 29,419. Frank O. Blake, Portland, Me.

BONE MARLINE-SPIKE.

Made from the jawbone of sperm whale. 29,455. Robert D. Baxter, Provincetown, Mass.

PRICKER.

Sailmakers' marline-pricker. 25,148. Wilcox, Crittenden & Co., Middletown, Conn.

SPLICER.

Splicer or pricker. 29,418. Wilcox, Crittenden & Co., Middletown, Conn. Used for splicing trawl-lines.

SPLICER.

Copper marline-spike. Made at sea by Thomas Freeman. Used for splicing trawl-lines. Sandford Freeman, Norwichport, Mass. 25,672.

SPLICER.

Iron, pointed at one end, eye at other. Used for splicing fishing lines. Gloucester, Mass., 1878. 32,693. G. Brown Goode.

59. ACCESSORIES.

SCOUT-HORNS.

SCOUT-HORN.

A wooden pole having a piece of a leather boot-leg fastened to one end so as to form a scoop. Length of pole, 10 feet. U. S. Fish Commission. 54,699. Used in former years to wet the sails of small vessels in order to make them set flat and hold the wind when sailing close-hauled.

BARREL-LIFTERS.

BILGE-HOOKS.

An iron hoop, jointed, provided with stout iron teeth to grasp the object encircled; semicircular handle or bail with eye in center, into which the hoisting-tackle is hooked. Diameter of hoop 22 inches; size of iron five-eighths inch. Gloucester, Mass., 1883. 57,827. U. S. Fish Commission. Used for hoisting barrels filled with fish and brine and having one head out.

LONG BILGE CAN-HOOKS.

Two iron rods with hooks attached to lower ends, and a manila rope strap spliced with eyes at upper ends. Length of rods, $2\frac{1}{2}$ feet; rope strap ($\frac{3}{4}$-inch manila), $4\frac{1}{2}$ feet; hooks, $2\frac{1}{2}$ inches wide. Gloucester, Mass., 1883. 57,834. U. S. Fish Commission. Used for lifting barrels which have one head out and are full of fish and brine.

BARREL-LIFTERS.

Two galvanized-iron can-hooks, with hollow cylindrical-shaped handles. Length of hooks, $4\frac{1}{2}$ inches, width $2\frac{1}{2}$ inches, handle $4\frac{1}{2}$ inches. Middletown, Conn. 56,891. Wilcox, Crittenden & Co. Used for stowing mackerel barrels in a vessel's hold, also for loading barrels on cars. One hook is held in each hand and hooked into the chimes of a barrel; the knee is then pressed against the bilge and the barrel is easily lifted without cutting the fingers.

ICE-HOOKS AND MALLETS.

ICE HOOKS.

Iron, steel pointed. Two flat, semi-circular, sharp pointed hooks, riveted together near their tops, and provided with oval-shaped handles at the upper ends. Gloucester, Mass., 1878. 32,647. G. Brown Goode. Used for lifting ice by hand, or for hoisting it on board of the vessels or to and from the wharves.

ICE-MALLETT (large).

The head is a cylindrical block of lignum-vitæ, sawed off square at each end, and slightly flattened at the side next the handle, which is of hard wood. Length of head 6½ inches, diameter 6 inches; handle 25 inches long, 1½ inches thick. Gloucester, Mass., 1880. 39,191. U. S. Fish Commission. Used in vessel's hold for crushing ice for packing fresh fish.

ICE-MALLET (small).

The head is a cylindrical block of lignum-vitæ, sawed square at each end, slightly flattened on side next to the handle, which is of hard wood. Length of head 6 inches, diameter 5 inches; handle 28 inches long, and 1½ inches thick. Gloucester, Mass., 1880. 39,192. U. S. Fish Commission. Used in winter on deck of fishing vessels to break ice from the rigging, sails, &c.

WATER-JUGS.

DORY WATER-JUG.

Earthenware, brown, glazed; capacity, one gallon. Gloucester, Mass., 1883. 57,819. U. S. Fish Commission. Used to carry supply of water for fishermen when absent from vessels in dories.

BOOM-SUPPORTERS.

SMALL'S PATENT BOOM-CROTCH SUPPORTERS.

"This invention consists of two braces, each one being formed of two parts, united by means of screw coupling-links, with hooks formed on their outer ends. These hooks are inserted in the bail of the mainboom and then into the ring-bolts in the deck; a few turns of the screw-links secures the boom in the crotch so firmly that there is no motion whatever. By means of these supporters vessels can go with one set of crotch tackle-blocks, thus effecting a saving every year in rigging. They will last as long as the vessel lasts; they will not shrink or expand as rigging will, and will prevent all creaking and straining." Gloucester, Mass. 57,831. Exhibited by Adolph Voss. These articles are made of galvanized iron and specially

SMALL'S PATENT BOOM-CROTCH SUPPORTERS—Continued.

designed for use on fishing vessels at sea, and have been found so much better adapted for the purpose for which they are made that they have been quite generally adopted.

BUOYS.

CABLE BUOY.

Heavy oak, iron-bound cask, having 8 iron hoops, and slung with stout manila rope. Dimensions: Length of staves, 46 inches, diameter of heads, 20½ inches. Provincetown, Mass., 1883. 56,945. U. S. Fish Commission. Buoys of this kind are used by the codfishing vessels from Provincetown and other New England ports for the purpose of buoying their cables so as to keep them off the bottom when fishing at Virgin Rocks on the Grand Bank and elsewhere where there is rocky ground. Several of these buoys are fastened to the cable when a long scope is paid out.

CLAWS.

DEVIL'S CLAW.

Made of galvanized iron. A double claw, 4½ inches long, with eye at top. Provincetown, Mass. 29,442. Gift of W. H. Hesbolt. Used to stop the chain when the windlass is wanted for other purposes.

PADDLES.

CANOE-PADDLES.

Two paddles used by the Haidah Indians. Ornamented. Length, 61 inches. Queen Charlotte Islands. 72,675. James G. Swan.

FISHING-PADDLE.

The common form of paddle used by the natives when fishing. Length, 50 inches. Makah Indians, Cape Flattery, Washington Territory. 72,694. James G. Swan. The paddles of the Makahs are made of yew, and are usually procured by barter with the Clyoquot Indians. Blade broad; end rounded in an ovalor lanceolate form. When new the paddles are blackened by slightly charring them in the fire, and polished.

D.—FISHERMEN AND ANGLERS.

60. Figures of fishermen.

Skipper of mackerel schooner.

Plaster cast of the master of a New England mackerel schooner, dressed in a suit often worn in wet summer weather, namely, officer's long oiled coat, sou'wester, and sea-boots. He is represented with a pair of marine glasses at his eyes as though engaged in looking for schools of fish or in watching the movements of distant vessels. Washington, D. C., 1883. U. S. Fish Commission.

Mackerel fisherman.

Plaster cast of a purse-seine mackerel fisherman, dressed in a suit of yellow oiled clothes, sou'wester, and leather boots; holds in his hands a large dip net such as are used for bailing mackerel from the seine to the vessel's deck. Washington, D. C., 1883. U. S. Fish Commission.

Skipper of a halibut schooner.

Plaster cast of the captain of a New England halibut schooner, dressed in a suit (trousers and jacket) of rubber clothes with rubber boots and oiled sou'wester. He is represented as reading from his patent log, which he holds in his hands, the distance the vessel has run. Washington, D. C., 1883. U. S. Fish Commission.

Halibut fisherman.

Plaster cast of a New England halibut fisherman, dressed in a suit of black oil clothes, rubber boots, and sou'wester, and holding a "halibut killer" (a stout club) in his right hand, while on his left shoulder is a winch for heaving in the trawl-lines, usually called a "hurdy-gurdy." Washington, D. C., 1883. U. S. Fish Commission.

Swordfish fisherman.

Plaster cast of a swordfish fisherman, dressed in woolen clothing, standing in the "pulpit" at bowsprit end, holding the staff of a swordfish-iron in his hand as if in the act of striking a fish. The method of catching swordfish, as practiced on the New

SWORDFISH FISHERMAN—Continued.

England coast, is to steer the vessel directly for the fish, the presence of which is made known by the appearance of its tail and dorsal fin above the water's surface. When the man at the bowsprit is directly over the fish, which generally happens before the latter is frightened by the approaching vessel, the iron is thrown, and as the craft sails along the harpoon-line is reeled out and finally let go, having a buoy at its end. Later the buoy is recovered and the fish killed and taken on board. Washington, D. C., 1883. U. S. Fish Commission.

SHAD FISHERMAN.

Plaster cast of a negro shad fisherman of the Southern States, dressed in woolen trousers and shirt, barefooted, holding an oar in his hands. Washington, D. C., 1883. J. E. Hendley, United States National Museum, Washington, D. C. (The lay figures in the collective exhibit of the United States, with the exception of the whalemen, were made by Mr. Hendley.)

SHAD FISHERMAN.

Plaster cast of a negro shad fisherman of the South, barefooted, dressed in woolen trousers and shirt and straw hat, holding an oar in his hands. Washington, D. C., 1883. U. S. Fish Commission.

WHALEMAN.

Plaster cast of a harpoonersman in the act of striking a whale. The figure is dressed in woolen clothing; is mounted in the bow of a whaleboat, and holds in his hands a harpoon which he appears to be just in the act of throwing. Washington, D. C., 1883. U. S. Fish Commission.

WHALEMAN.

Plaster cast of a whaleman at the masthead on the lookout for whales; dressed in woolen clothing, with a common telescope spy-glass at his eye. Washington, D. C., 1883. U. S. Fish Commission.

WHALEMAN.

Plaster cast of a whaleman standing on a cutting-in stage; dressed in woolen clothing, with "belly band" around him, and holding a cutting spade in his hand. This illustrates the position in which whalemen stand on a ship's side when cutting-in or stripping the blubber from a whale. Washington, D. C., 1883. U. S. Fish Commission.

61. PHOTOGRAPHS OF FISHERMEN AND FISH MERCHANTS.*

IRISH FISHERMEN.

Three Irish fishermen belonging to the cunner boats at Commercial Wharf, Boston, Mass., 1882. (Photo. No. 1809.) U. S. Fish Commission.

AGED FISHERMEN OF NEW ENGLAND.

Two old New England fishermen—1. Thomas Thompson, and, 2. William Tarr Abbott—who claim to have been captured in the war of 1812–'15 and incarcerated in Dartmoor prison, England. Rockport, Mass., 1882. (Photo. No. 1826.) U. S. Fish Commission.

GROUP OF OLD FISHERMEN.

Group of eight oldest fishermen of Rockport. Combined ages, 656 years. Rockport, Mass., 1882. (Photo. No. 1827.) U. S. Fish Commission.

NEW ENGLAND FISHERMEN.

Crowd of fishermen—chiefly mackerel catchers—on Leighton's Wharf, waiting for a change of weather, which may enable them to leave port. Gloucester, Mass., 1882. (Photo. No. 2074.) U. S. Fish Commission. When unfavorable winds or calms (as in this instance) prevent the vessels from sailing the skippers and crews generally gather on the wharves nearest to their respective schooners and wait for a change in the wind or weather which may permit of their sailing.

MACKEREL FISHERMEN.

Capt. Solomon Jacobs and full crew—17 men, all told—of mackerel schooner Edward E. Webster, of Gloucester, Mass. This vessel carries two purse-seines and two seine-boats. In three years she has stocked a total of $83,600 as follows: 1880, $19,800; 1881, $26,800; 1882, $37,000. Her catch in the last mentioned year was 1,170,000 fresh mackerel, in number, and 2,250 barrels of salted mackerel. Time employed each season, about eight months. Gloucester, Mass., 1882. (Photo. No. 2088.) U. S. Fish Commission.

CREW OF A FRESH-HALIBUT SCHOONER.

Crew of the fresh-halibut schooner Isaac Chapman, of Gloucester; ready for sea, waiting for steam-tug to come and tow the vessel out of the harbor. Gloucester, Mass., 1882. (Photo. No. 2110.) U. S. Fish Commission.

---

*The numbers given are those belonging to the negatives from which the photographs were made, and should not be confounded with the National Museum catalogue numbers attached to various other exhibits.

FRESH-HALIBUT FISHERMEN.

Crew of the fresh-halibut schooner Gertie E. Foster, on deck of their vessel. This is a crew of mixed nationalities, and may well illustrate the class of men often found on board of a Gloucester fishing vessel. Three of them, including the captain, are Norwegians, two are Swedes, three natives of the United States, one a Dane, and one a Prussian. Gloucester, Mass., 1882. (Photo. No. 2068.) U. S. Fish Commission.

NORWEGIAN FISHERMEN.

Group of Norwegians—the skipper and part of the crew of schooner Gertie E. Foster, of Gloucester, Mass.: Capt. Thomas Olsen, William Thompson (ex-captain), Christophor Nelsen. Gloucester, Mass, 1882. (Photo. No. 2069.) Natives of Norway and Sweden are among the most daring, skillful, and successful of the New England fishermen.

SWEDISH FISHERMEN.

Group of Swedish fishermen, part of the crew of schooner Gertie E. Foster, of Gloucester: Lars Sterling and Frank Stream. Gloucester, Mass., 1882. (Photo. No. 2070). U. S. Fish Commission.

DANISH AND PRUSSIAN FISHERMEN.

Two members of the crew of schooner Gertie E. Foster, of Gloucester, one a Dane, the other a Prussian: Sinius Nelsen, of Copenhagen (sitting down), Paul Wilhelms, of Dantzig, Prussia. Comparatively few Danes or Prussians are employed in the New England fisheries. Gloucester, Mass., 1882. (Photo. No. 2071.) U. S. Fish Commission.

AMERICAN HALIBUT FISHERMEN.

Three American fishermen, members of the crew of schooner Gertie E. Foster, of Gloucester: Fred Woods, of Newport, R. I.; James Abbot, of Gloucester, Mass.; John Harris, of New London, Conn. The greater part of the native-born American fishermen sailing from Gloucester are natives of Maine and Massachusetts. Gloucester, Mass., 1882. (Photo. No. 2072.) U. S. Fish Commission.

HALIBUT FISHERMEN.

Capt. Jerome McDonald and group of other Prince Edward Islanders, part of the crew of schooner G. P. Whitman, employed in the fresh-halibut fishery. Gloucester, Mass., 1882. (Photo. No. 2076.) U. S. Fish Commission.

CREW OF PORTUGUESE HADDOCK FISHERMEN.

View of the schooner Ontario, of Gloucester, with her crew of Azorean Portuguese at work on deck cleaning their trawl-lines.

CREW OF PORTUGUESE HADDOCK FISHERMEN—Continued.

The names are as follows: Capt. Joseph F. Silva, Manuel Simmons, Joseph Francis, Fred Pryor, Manuel Enas, Joseph Rotche, Antoine G. Silva, Christian Veada, John J. Fouswick. All Azoreans. Captain Silva is about forty years old; came to Gloucester thirty years ago. Gloucester, Mass., 1882. (Photo. No. 2093). U. S. Fish Commission. It is not an unusual thing for the Portuguese fishermen to drop their own and adopt English names while on board of the vessels.

AZOREAN PORTUGUESE FISHERMEN.

Groups of Portuguese fishermen (natives of the Azores) on shore at the building of John Pew & Sons. A large number of Azoreans are settled in Gloucester; they are good fishermen, and in some cases fishing schooners are commanded and manned exclusively by natives of the Azores. Gloucester, Mass., 1882. (Photo. No. 2065.) U. S. Fish Commission.

NOVA SCOTIA FISHERMEN.

Crew of the schooner Mystic baiting haddock trawl-lines on deck; all Nova Scotia men; commencing on the left the names are as follows: Richard Mulloy, Capt. John McKinnon (master) and boy, Abraham Cheiror, Andrew Nelson, Michael Ryan, Patrick Vale, Archibald Chisholm, Daniel McKay, Michael Longan, and Alexander Landrey. A large percentage of the fishermen sailing from Gloucester are natives of the British North American provinces; they are generally hardy and daring men, and are among the most skillful fishermen sailing from New England. Gloucester, Mass., 1882. (Photo. No. 2066.) U. S. Fish Commission.

CREW OF NEW YORK BLUE-FISH FISHERMEN.

Crew of schooner Isabel, of Greenport, Long Island, engaged in blue-fish fishing. Capt. Fred. Chip, Fred. Conkling, Coleman McMullen, George Hathaway (the one with pipe a Portuguese), James Joseph (at tub, Portuguese), Charles Bishop, James Cassidy. New York, 1882. (Photo. No. 2121). U. S. Fish Commission.

INDIAN FISHERMEN.

Group of Passamaquoddy Indian porpoise hunters at Pleasant Point, near Eastport, Me. Tomaso with oar; Sosef Piel with spear; Sosef Lolar with gun, and Sosef Noel in boat. Eastport, Me., 1882. (Photo. No. 1906.) U. S. Fish Commission.

WHALING CAPTAINS.

Group of whaling skippers. New Bedford, Mass., 1882. (Photo. No. 1818.) U. S. Fish Commission.

PORTUGUESE WHALEMEN.

Group of Azore Portuguese whalemen. (1) Serge de Rosa, Fayal, 1850; (2) John José Alexander, Pacheco; (3) Estehan José, Rico, 1870. Of whaleship Catalpa, New Bedford, Mass., 1882. (Photo. No. 1820.) U. S. Fish Commission. A large percentage of the whalemen sailing from New Bedford are Portuguese, who are generally shipped at the Azores and other islands, where the ships touch on their outward passage to the whaling grounds. Many of the officers of the whaling fleet are Portuguese.

WHALEMEN.

Group of three whalemen, names as follows: Tom. Peter; Grafton Dermie; Wm. M. James. New Bedford, Mass., 1882. (Photo. No. 2133.) U. S. Fish Commission.

KANAKA WHALEMAN.

A Kanaka whaleman, native of the Sandwich Islands. New Bedford, Mass., 1882. (Photo. No. 2134.) U. S. Fish Commission.

WHALEMEN.

Two of the crew of bark Swallow, of New Bedford. John Barlles, height 6 feet 3 inches, born in Essex County, Virginia; John Bay, from Anabon, Africa. New Bedford, Mass., 1882. (Photo. No. 2140.) U. S. Fish Commission.

HUDSON BAY WHALEMEN.

Three Hudson Bay whalemen dressed in furs. (1) James Grady; (2) Alex. Grace; (3) Joseph A. Francis. New Bedford, Mass., 1882. (Photo. No. 2141.) U. S. Fish Commission.

FISH MERCHANTS.

Group of old fishing merchants, all of whom have formerly been fishermen. (1) Daniel Sayward, born September 3, 1802; a fisherman for 50 years, and then fitter and owner of fishing vessels. (2) William Henry Wonson, born July 22, 1804; went fishing for 40 years; established smoked-halibut business in 1850. (3) John Pew, born August 19, 1807; went fishing till 1849; established the fishing firm of John Pew & Sons in 1851. (4) Andrew Leighton, born December 10, 1819; went fishing till 1870, since which time he has been vessel fitter and owner. Gloucester, Mass., 1882. (Photo. No. 2092.) U. S. Fish Commission.

62. FISHERMEN'S WEARING APPAREL, ETC.

SUITS OF CLOTHES.

WINTER SUIT FOR ROUGHEST WEATHER.

Flannel shirt; rubber jacket; rubber pants; rubber boots; black oil-cloth sou'wester hat (Tower's make). (Displayed on lay figure of halibut skipper.)

SKIPPER'S SUMMER SUIT FOR DAMP WEATHER.

Blue flannel shirt; calico jumper; felt hat; long oil-cloth coat (Tower's make); leather boots. (Displayed on lay figure of mackerel skipper.)

SUIT FOR WET WEATHER IN SUMMER.

Woolen jumper; yellow oil-cloth jacket; yellow oil-cloth pants; black oil-cloth sou'wester; red leather boots. (Displayed on lay figure of mackerel fisherman.)

SUIT OF BLACK OIL-CLOTH FOR WET WEATHER.

Black oil-cloth jacket, double (second-hand); black oil-cloth pants, double (second-hand); black oil-cloth sou'wester hat; pair of rubber boots; flannel shirt. (Displayed on lay figure of halibut fisherman.)

TROUSERS AND OVERALLS.

DARK TROUSERS.

Made of heavy dark colored woolen cloth, lined, two side pockets, one hip pocket. Style of trousers most generally worn by New England fishermen. Gloucester, Mass, 1883. U. S. Fish Commission.

GRAY TROUSERS.

Made of heavy gray woolen cloth, with dark stripes. Half-lined, with two side pockets, one hip pocket, and metal buttons. About the average quality of trousers worn by New England fishermen on shipboard. Gloucester, Mass., 1883. 102,106. U. S. Fish Commission.

COTTON TROUSERS.

Made of heavy cotton plaid, with side-pockets and cheap metal buttons. Worn chiefly by cooks in summer. Gloucester, Mass., 1883. 102,108. U. S. Fish Commission.

COTTON TROUSERS.

Made of heavy black and white mixed cotton cloth. A cheap pair, with side pockets, and cheap metal buttons. Worn occasionally by fishermen, but more frequently by cooks of fishing vessels in summer. Gloucester, Mass., 1883. 102,107. U. S. Fish Commission.

BROWN OVERALLS.

Made of brown canvas. Provided with one hip pocket, two side pockets, and a watch pocket. Metal rivet buttons. Worn by New England fishermen and fish-packers. Gloucester, Mass., 1880. 42,710. U. S. Fish Commission.

BROWN PLAID OVERALLS.

Made of heavy cotton cloth. Provided with shoulder-straps, front bib, and left side pocket. Worn chiefly by cooks of fishing vessels in summer. Gloucester, Mass., 1883. 102,103. U. S. Fish Commission.

GINGHAM OVERALLS.

Made of brown and white gingham, with a left side pocket, shoulder-straps, and bib. Worn chiefly by cooks of fishing vessels. Gloucester, Mass., 1883. 102,105. U. S. Fish Commission. Duplicate of 102,105. Gloucester, Mass., 1883. 102,109. U. S. Fish Commission.

GINGHAM OVERALLS.

Made of blue and white gingham. With a left side pocket, shoulder-straps, and bib. Worn chiefly by cooks of fishing vessels. Gloucester, Mass. 1883. 102,105. U. S. Fish Commission.

JACKETS AND JUMPERS.

MONKEY JACKETS.

Made of blue chinchilla, lined with heavy checked flannel. A very heavy jacket, with inside and outside breast pockets; outside side pockets with flaps, a velvet collar, and gutta percha buttons. Worn by New England fishermen, chiefly in winter, but to some extent in summer on northern fishing grounds. Gloucester, Mass., 1883. 102,093. U. S. Fish Commission.

JUMPER JACKET.

Made of blue and white woolen cloth and lined with plaid flannel, with red flannel facings. This garment is similar to the jumper, but longer and without a band around the waist. Side pockets, a broad neckband, no collar, gutta-percha buttons. Worn by New England fishermen at all seasons, but especially adapted for wearing underneath oil clothing. Gloucester, Mass., 1883. 102,094. U. S. Fish Commission.

CARDIGAN JACKET.

A dark-brown knit jacket, with side pockets, horn-buttons, no collar, and close-fitting knit cuffs. Bound in front and on pockets. Worn by New England fishermen at all seasons, but chiefly during cold weather underneath a woolen jacket or oil-clothing. Gloucester, Mass., 1883. 102,095. U. S. Fish Commission.

WOOLEN JUMPER.

Made of blue and white cloth lined with red flannel. One breast pocket. The jumper is a short jacket-like garment worn by fishermen. This style is the one in most common use. It is worn

WOOLEN JUMPER—Continued.

chiefly in winter, spring, and fall, on land, but at all seasons on the northern fishing grounds. Gloucester, Mass., 1883. 102,087. U. S. Fish Commission.

GREEN GINGHAM JUMPER.

Made of green and white gingham. With breast pocket, and cheap metal buttons. Worn in warm weather as a substitute for a coat. Gloucester, Mass., 1883. 102,092. U. S. Fish Commission.

BROWN GINGHAM JUMPER.

Same as 102,092, except made of light and dark brown gingham. Gloucester, Mass., 1883. 102,090. U. S. Fish Commission.

DARK GINGHAM JUMPER.

Same as 102,092, except made of black and white gingham. Gloucester, Mass., 1883. 102,089. U. S. Fish Commission. Duplicate of 102,089. Gloucester, Mass., 1883. 102,091. U. S. Fish Commission.

HEAVY COTTON JUMPER.

Made of extra heavy checked cotton cloth. With breast pocket and metal buttons. Style commonly worn in summer by the New England fishermen. Gloucester, Mass., 1883. 102,088. U. S. Fish Commission.

SHIRTS AND DRAWERS.

BLUE FLANNEL SHIRT.

Made of best quality heavy blue flannel. The style commonly called "home-made." Provided with collar and cuffs, and porcelain buttons. In common use among the New England fishermen at all seasons of the year. Gloucester, Mass., 1883. 102,096. U. S. Fish Commission.

PLAID FLANNEL SHIRT.

Made of green, blue, and black plaid flannel; with porcelain buttons and facings for neckband and wristbands. No collar. Worn at all seasons, chiefly by Portuguese engaged in American fisheries. Gloucester, Mass., 1883. 102,098. U. S. Fish Commission.

GRAY FLANNEL SHIRT.

Made of heavy gray flannel, with neckband and wristbands and gutta-percha buttons. In common use among the New England fishermen. Gloucester, Mass., 1883. 42,708. U. S. Fish Commission.

BROWN FLANNEL SHIRT.

Made of heavy brown ribbed flannel, with wristbands and neckband. In very general use among the New England fishermen at all seasons. Gloucester, Mass., 1883. 102,097. U. S. Fish Commission.

PLAID SHIRT.

Made of plaid cotton and woolen cloth, with a neckband, wide wristbands, and no collar. Gloucester, Mass., 1883. 102,099. U. S. Fish Commission.

GINGHAM SHIRT.

Made of light-colored gingham, with neckband and wristbands. Worn chiefly by cooks on fishing vessels in summer. Gloucester, Mass., 1883. 102,102. U. S. Fish Commission.

STRIPED COTTON SHIRT.

Made of stout striped cotton, with neckband and wristbands. Worn by fishermen during the summer months. Gloucester, Mass., 1883. 102,101. U. S. Fish Commission.

PLAID SHIRT.

Made of heavy cotton plaid, with a laced bosom, collar, and wide wristbands. Commonly worn by cooks on board fishing vessels, but occasionally by fishermen. Gloucester, Mass., 1883. 102,100. U. S. Fish Commission.

WOOLEN UNDERSHIRT.

Made of coarse striped woolen cloth, commonly known as "whaleman's stripe." In very general use among the New England fishermen during the cooler portion of the year. Gloucester, Mass., 1883. 102,118. U. S. Fish Commission. Duplicate of 102,118. Gloucester, Mass., 1883. 42,721. U. S. Fish Commission.

WOOLEN UNDERSHIRT.

Woven, with red and white stripes. Factory made. Tight-fitting wristbands. Commonly worn by fishermen throughout the year. Gloucester, Mass., 1883. 102,117. U. S. Fish Commission.

COTTON UNDERSHIRT.

Woven of gray cotton. Factory made. Commonly worn by fishermen in summer. Gloucester, Mass., 1883. 102,119. U. S. Fish Commission.

WOOLEN DRAWERS.

Made of coarse striped woolen cloth, commonly known as "whaleman's stripe." The waistband is faced on the outside with twilled cotton. In very general use among New England fishermen during the cooler portion of the year. Gloucester, Mass., 1883. 102,115. U. S. Fish Commission. Duplicate of 102,115. Gloucester, Mass., 1880. 42,772. U. S. Fish Commission.

WOOLEN DRAWERS.

Woven, with red and white stripes. Factory made. Lined seams and waistband. Commonly worn by fishermen throughout the year. Gloucester, Mass., 1883. 102,114. U. S. Fish Commission.

COTTON DRAWERS.

Woven of gray cotton. Factory made. Commonly worn by fishermen in summer. Gloucester, Mass., 1883. 102,116. U. S. Fish Commission.

APRONS.

FISH-SKINNER'S APRON.

Made of white canvas. With a neckband, a back-strap, and a pocket on the right side. Style of apron commonly used by men employed in skinning and boning fish. Gloucester, Mass., 1883. 102,110. U. S. Fish Commission.

COOK'S APRON.

Made of brown canvas. Provided with pockets, and with neck and back straps. Used by cooks on fishing vessels. Gloucester, Mass., 1880. 42,753. U. S. Fish Commission.

SOCKS.

WOOLEN SOCKS.

Made of mixed woolen yarn, with white toes and tops. Extensively worn by New England fishermen. Gloucester, Mass., 1883. 57,644. U. S. Fish Commission.

RIBBED WOOLEN SOCKS.

Knit of heavy blue yarn, with white toes and tops. Commonly worn by New England fishermen. Gloucester, Mass., 1883. 57,888. U. S. Fish Commission.

MITTENS, GLOVES, AND NIPPERS.

RUBBER MITTENS.

Outside of rubber cloth, lined with red flannel. Gloucester, Mass., 1883. 57,873. U. S. Fish Commission. Used in cold and stormy winter weather by New England fishermen.

FISHERMEN'S MITTENS.

Knit of woolen yarn, and of large size to allow for shrinkage. Gloucester, Mass., 1882. 57,883. U. S. Fish Commission. Worn while dressing fish, or in cold, stormy weather.

WOOLEN MITTENS.

Home-made. Knit of white woolen yarn. Used by New England cod-fishermen while dressing fish, or for protecting the hands against cold. Extra quality. Gloucester, Mass., 1880. 39,286. U. S. Fish Commission.

WOOLEN MITTENS.

Known to the fishermen as "Newfoundland cuffs." Made of very heavy woolen cloth, called "swan's skin," with a heavy nape. Used to a considerable extent by the fishermen of Gloucester, being the warmest mitten used among the fishermen. Gloucester, Mass., 1880. 25,788. U. S. Fish Commission.

COTTON MITTENS.

Made of twilled cotton cloth, with thumb lined. Used by fishermen of New England while dressing mackerel. Gloucester, Mass., 1883. 54,385. U. S. Fish Commission.

COTTON MITTENS.

Made of twilled cotton cloth, with thumbs protected by an extra thickness of cloth; provided with a rubber band for drawing them closely around the wrist. Used by the fishermen of New England in dressing mackerel. Gloucester, Mass., 1880. 57,879. U. S. Fish Commission.

OIL-CLOTH MITTENS.

Made of white cotton cloth rendered waterproof by a preparation of linseed oil. Used by the fishermen of New England for protecting their hands in stormy weather or when handling wet ropes. Gloucester, Mass., 1883. 102,120. U. S. Fish Commission. Duplicate of 102,120. 102,077.

GIBBING GLOVES.

Made of canton flannel. Worn by the mackerel fishermen of New England when gibbing mackerel. Gloucester, Mass., 1880. 102,075. U. S. Fish Commission.

HAND-HAULER.

A peculiarly shaped mitten, knit from white woolen yarn. It has a half-thumb and forefinger, the remaining fingers being entirely wanting. Used to protect the hands from cold while using nippers in winter fishing. Gloucester, Mass., 1883. 57,882. U. S. Fish Commission.

FISHERMEN'S NIPPERS.

Knit of woolen yarn and stuffed with woolen cloth. Gloucester, Mass., 1883. 57,884. U. S. Fish Commission. Used on the hands of fishermen to enable them to grasp and hold a fishing-line better than they otherwise could do. Duplicates of these nippers are numbered 42, 706, 102,070–102,074.

FISHERMEN'S NIPPERS.

Knit of white woolen yarn and stuffed with pieces of woolen cloth. U. S. Fish Commission. 57,886. Used when hauling fishing-lines.

WOOLEN NIPPERS.

Thin circular bands of woolen cloth, covered with white knitted yarn. Used by the fishermen of Cape Cod in the shore, trawl, and hand-line fisheries for protecting the fingers when hauling in the lines. Provincetown, Mass., 1880. 25,717. Gift of Central Wharf Company.

HATS AND CAPS.

SOFT FELT HAT.

Made of black felt, with a silk band and binding. Style commonly worn by New England fishermen. Gloucester, Mass., 1883. 102,131. U. S. Fish Commission.

STRAW HAT.

Made of common straw, and has a black band. Worn by New England fishermen in summer. Gloucester, Mass., 1883. 102,130. U. S. Fish Commission.

RUSSIAN CAP.

Made of lambskin, tanned, with wool-lined ear protectors, and peak. Worn by New England fishermen in extremely cold weather. Gloucester, Mass., 1883. 102,129. U. S. Fish Commission.

SCOTCH CAP.

Made of blue cloth, without seams. Visor made of pasteboard covered with cloth. A cambric lining. Gloucester, Mass., 1883. 102,128.

WOOLEN CAP.

Made of blue cloth. Provided with plush ear protectors, which extend entirely around the cap, buttoning on one side. A leather visor covered with cloth, and a heavy quilted lining. Commonly worn by New England fishermen. Gloucester, Mass., 1880. 42,720. U. S. Fish Commission.

WOOLEN CAP.

Made of blue chinchilla. Provided with ear protectors, which extend entirely around the cap, buttoning in front. A pasteboard visor, covered with cloth. Lined with red flannel. Commonly worn by New England fishermen. Gloucester, Mass., 1883. 57,891. U. S. Fish Commission.

OILED CLOTHING, ETC.

[Exhibit of A. J. Tower, Boston, Mass.]

a. Double goods, yellow. Fish brand.

"All garments bearing the fish brand trade mark are provided with a zinc-metal button which cannot break or rust, which is attached by means of a brass-wire staple passing through the button and fabric, thence through a stay or small button on inside of garment, and the ends of the staple securely interlocked in such a manner as to render the accidental detaching of the button an impossibility. An invaluable consideration to seamen."

1. OFFICERS' LONG COAT, WITH INSIDE SLEEVE, LEATHER BUTTON-HOLES, PATCHED ELBOW, EPAULET ON SHOULDER, ETC.

"This coat is an extra fine grade, and designed for officers of steamers and sailing vessels of all kinds. Price, $39 per dozen."

2. LONG COAT, PATCHED ELBOWS, INSIDE SLEEVES, AND EPAULETS.

"This coat is the most universally used of any of the styles manufactured. It is very popular with subordinate officers on shipboard, and with farmers and truckmen in all parts of the country. Price, $30 per dozen."

3. JACKET.

"Designed with special reference to the requirements of fishermen, being short, waterproof, and durable, and is the acknowledged favorite among the discriminating New England fishermen. Price, $15 per dozen."

4. FISHERMEN'S APRON TROUSERS.

"Used in connection with the jacket above described, and also independently while dressing fish in dry weather. This garment is an absolute necessity with fishermen. Price, $15 per dozen."

5. SEAMEN'S STRING TROUSERS.

"Used by seamen proper, being very conveniently adjusted to the wearer, an item of vast importance to the sailors of the merchant marine. The waist is made adjustable in size by means of a draw-string running through the waistband; hence the derivation of the name of the garment. Price, $14.50 per dozen."

6. FROCK OR HALF COAT.

"A medium length between the long coat and jacket, and used chiefly in connection with long (hip) gum boots, by oyster fishermen; also by sportsmen, with (hunting) gum boots; they are also used in connection with pants. Price, $22 per dozen."

7. PETTICOAT BARVELL.

"A very useful garment to fishermen, better serving the purpose of pants in warm weather, by permitting the free circulation of air around the body of wearer, and at the same time affording complete protection from wet when used in connection with gum boots. Price, $10.50 per dozen."

8. BARVELL OR APRON.

"Used chiefly by fish packers, pork packers, tanners, oystermen, and in fact any class of workmen at a bench where exposed to wet or oil. To leather dressers the barvell is indispensable, inasmuch as the waterproofing compound is unaffected by acids or chemicals. Price, $9.50 per dozen."

9. SLEEVES.

"Used in connection with petticoat and apron barvells, and are very convenient to fish packers in protecting shirt sleeves in winter, thereby obviating the necessity of turning shirt sleeves up, and exposing the bare arm in cold weather. Price, $4 per dozen."

b. Double goods, black. Fish brand.

10. LONG COAT.

"Inside sleeves, patched elbow, epaulet on shoulder, &c., made of same material as the yellow coat of same style, and preferred by some for use on land on account of color. Price, $30.50 per dozen."

11. JACKET.

"Used principally by fishermen and sailors; same style as the yellow jackets. Used also by miners. Price, $15.50 per dozen."

12. FISHERMEN'S APRON TROUSERS.

"The same as corresponding pants in yellow before described; highly popular among fishermen. Price, $15.50 per dozen."

13. STRING TROUSERS.

"Same as the yellow string pants. Used by sailors and miners."

14. PETTICOAT BARVELL.

"Differs from the yellow petticoat barvell only in color. Price, $10.50 per dozen."

15. COMMON BARVELL.

"Same as the yellow barvell. Price, $9.50 per dozen."

16. SLEEVES.

"Same as the yellow. Price, $4 per dozen."

c. Oiled hats.

17. "CAPE ANN" SOU'WESTER.

"The most comfortable hat made for fishermen and seamen generally. No fisherman would be without one. It is provided with a neck piece and earlaps lined with flannel, and affords a complete protection for these members in severe weather. This hat is black, with a medium soft crown and stiff rim. Price, $6.50 per dozen."

18. SOFT YELLOW SOU'WESTER.

"The same in shape as the "Cape Ann," and lined with flannel, with neck piece and earlaps. Crown and rim soft, and can be put in coat pocket. This cap is worn principally by officers. It is a favorite with seamen on the great American lakes. Price, $6.50 per dozen."

19. SOFT BLACK SOU'WESTER.

"Made in shape more like a common soft felt hat, and designed for use on land, and more principally by truckmen, farmers, &c. The material is lighter than used in the previously mentioned styles. Lined with red flannel and provided with neck piece and earlaps. Price, $6.50 per dozen."

20. YELLOW AND BLACK 'SQUAM SOU'WESTER.

"These hats are made to supply a cheap trade, and are worn principally by sailors. They are stiff crown and rim and lined with canton flannel. Provided with earlaps only. Price, $3.50 per dozen."

21. MINERS' OILED HAT.

"This is a light-weight hat made in yellow and black, and worn exclusively by miners. It is provided with a leather on front, to which may be affixed the miner's lamp. The rim is straight and held in shape by reeds inclosed therein. The lining is of canton flannel and provided with earlaps. Price, $3.75 per dozen."—(*A. J. Tower.*)

RUBBER SOU'WESTER HAT.

Outside covering, brim, and strap of rubber cloth; inside of crown lined with flannel. Gloucester, Mass., 1883. 57,869. U. S. Fish Commission. Used chiefly in cold and stormy winter weather, but are not so generally used as the oil-cloth sou'westers.

BARK CAPE.

An article of dress worn by fishermen to protect the neck and shoulders from rain. Universally worn by all native fishermen and women in canoes, during wet weather. Length 14 inches. Makah Indians, Neah Bay, Washington Territory, 1883. 72,662. James G. Swan.

BOOTS, SHOES, MOCCASINS, ETC.

GUM BOOTS.

Made of the best quality of rubber, and lined with felt. In general use among fishermen. Gloucester, Mass., 1883. 102,139. U. S. Fish Commlssion.

RUBBER BOOTS.

Made of common rubber. Provided with heavy wooden soles and heels, fastened with heavy screws. This style was introduced about 1880, and is used chiefly by fish-packers. The fishermen object to using them on account of the stiffness of the sole and liability to slip on a vessel's deck. Gloucester, Mass., 1883. 102,138. U. S. Fish Commission.

BLACK LEATHER BOOTS.

Made of extra-heavy grained leather; soles of double thickness. Used extensively by fishermen. Gloucester, Mass., 1883. 102,140. U. S. Fish Commission.

RED LEATHER BOOTS.

Made of uncolored extra-heavy grained leather; soles double thickness. Used extensively by fishermen. Gloucester, Mass., 1883. 42,718. U. S. Fish Commission. A duplicate is numbered 42,727.

LAMB-SKIN SLIPPERS.

Made of thin (reddish-colored) lamb-skin. Gloucester, Mass., 1883. 57,872. U. S. Fish Commission. Worn over stockings inside of sea-boots.

FELT SLIPPERS.

Made of gray felt, moccasin-shaped. Gloucester, Mass., 1883. 57,887. U. S. Fish Commission. Worn over stockings inside of sea-boots in winter to keep the feet warm.

LEATHER MOCCASINS.

Made of red oil-tanned leather; the soles and uppers being formed of the same leather. Gloucester, Mass., 1883. 57,875. U. S. Fish Commission. These have recently come into use among the fishermen of New England, and are much worn in summer on board of vessels.

CORK SOLES.

Soles made of thin pieces of cork covered with cloth, and shaped so as to fit inside of boots. Gloucester, Mass., 1883. 57,877. U. S. Fish Commission. Worn inside rubber boots.

BED-CLOTHING, ETC.

FISHERMAN'S BLANKET.

A single gray woolen blanket, with blue stripes; cheap quality. Used by the fishermen of New England in their bunks on fishing vessels. Gloucester, Mass., 1883. 102,079. U. S. Fish Commission.

FISHERMAN'S BLANKET.

A double gray woolen blanket, with blue stripes, of average quality. Used by fishermen of New England in their bunks on fishing vessels. Gloucester, Mass., 1883. 57,644. U. S. Fish Commission.

EYE-PROTECTORS.

GOGGLES.

Wood, with a continuous longitudinal slit in front and arch for the nose. Length, 6¼ inches. Lower Yukon River, Alaska. 48,724. Collected by E. W. Nelson. Fastened to the head with a seal-skin thong, and used to protect the eyes from the glare of snow and ice.

EYE-PROTECTOR.

A shade made of wood to screen the eyes from the glare of the water; seal-skin band or head-strap. Depth in front, 3⅝ inches. Cape Darby, Alaska, 1880. 44,144. Collected by E W. Nelson.

GOGGLES.

Wood, with longitudinal slit, ovate apertures at either end, and an arch for the nose. Length, 6¼ inches. Kushunuk, Alaska, 1880. 36,352. Collected by E. W. Nelson. Fastened to the head with a seal-skin thong, and used to protect the eyes from the glare of the snow and ice.

63. RECEPTACLES FOR CLOTHING.

BLACK CLOTHES-BAG.

Made of white cotton canvas, painted black; brass eyelet-holes around top for bag lanyard to reeve through. Length, 3 feet; width, 19 inches. Gloucester, Mass., 1883. 57,890. U. S. Fish Commission. In very common use on fishing vessels.

WHITE CLOTHES-BAG.

Made of white cotton canvas, circular bottom; brass eyelet-holes around the top for the bag lanyard to reeve through. Length of bag, 3 feet; width, 19 inches. Gloucester, Mass., 1883. 57,889. U. S. Fish Commission. Used for holding wearing apparel.

WHITE CLOTHES-BAG.

A canvas bag with brass eyelets for the bag-line to reeve through. Circular canvas bottom. Used by fishermen and sailors for carrying clothes when at sea. Length, 40 inches; width, 20 inches. Gloucester, Mass., 1880. 42,754. U. S. Fish Commission.

HOME-MADE CLOTHES-BAG.

Made of light canvas, with a hem at the top through which a string passes for closing the mouth of the bag. Used by fishermen and sailors of New England for holding their clothes on a voyage. Depth, 40 inches; width, 30 inches. Gloucester, Mass., 1883. 102,076. U. S. Fish Commission.

CHEST.

Elaborately carved and painted. Yellow cypress wood, commonly called "Sitka cedar." Made by a Haida Indian named "Bear Skin." Skidgate, Queen Charlotte Islands. Design on front, the raven, or "Hooyeh," with a sea-urchin in its beak. The painting and carving on the back is the totem of the bear; bear totems on each end; on top is the fish-eagle, or "Koot." Dimensions, $50\frac{1}{2}$ by 27 by $23\frac{1}{4}$ inches. Port Townsend, Washington Territory, 1883. James G. Swan.

64. ANGLERS' WEARING APPAREL, ETC.

ANGLER'S TROUSERS.

Made of brown canvas; provided with side and hip-pockets; metal buttons. The legs are buttoned from the ankle up to the knee, so as to fit over top boots. New York, 1880. 102,134. U. S. Fish Commission.

GUNNER'S REVERSIBLE VEST.

Made of brown canvas, provided with cartridge-holders, with covers, to keep out moisture. On the lower part of the inside on either side is a large game-pocket, capable of holding 72 rounds of cartridges, in addition to the pockets for holding game and other things. New York, 1880. 102,136. U. S. Fish Commission.

OIL-CLOTH HAT.

Made of black glazed oil-cloth, lined with canton flannel; cotton ear-tabs. Back projects to protect the neck from rain. Used by anglers and sportsmen. New York, 1883. 102,133. U. S. Fish Commission.

WADING-SHOES WITH HOB-NAILS.

One pair. Heavy white canvas and leather tops, laced; leather tongues; low heels; heavy nails on heels and soles; size, 7½. U. S. Fish Commission. 57,659. Made especially for anglers. "Do not harden, dry quickly, and prevent slipping on the rocks."

ANGLER'S WADING-SHOES.

Made of untanned cowhide; oil-dressed to render them water-proof; laced in front, the opening being protected by a leather piece which is sewed in along either side; heavy soles studded with hob-nails. Worn by anglers and sportsmen when wading about in rocky creeks. Bergen, N. J. 42,852. U. S. Fish Commission.

BLACK RUBBER WADING-STOCKINGS.

Made of a good quality of rubber cloth; hip stockings, with thin soles, to be worn on bare feet or over ordinary stockings. Used by anglers. New York, 1880. 42,846. U. S. Fish Commission.

ANGLER'S CAMP-PILLOW.

A rectangular, air-tight rubber-cloth bag, with metal mouth-piece, by means of which it can be inflated. New York, 1883. 57,648. U. S. Fish Commission.

RUBBER BLANKET.

Made of rubber cloth. Used by anglers and sportsmen for protecting their bedding from the rain and also for wrapping their clothing in transportation. New York, 1883. 57,647. U. S. Fish Commission.

CANVAS COVER FOR BLANKETS.

Water-proof. 42,865. U. S. Fish Commission. (C. B. & M.)

RUBBER CAMP-BAG.

Made of rubber cloth; two handles; brass eyelet at top, through which may be rove a string to close the bag. Depth of bag, 2½ feet; width, 19 inches. 57,662. U. S. Fish Commission.

RUBBER CAMP-BAG.

Same as 57,662, except smaller. Depth, 2 feet; diameter, 10½ inches. New York, 1883. 42,864. U. S. Fish Commission.

CAMP-BAG COVER.

Made of brown canvas. A round-bottom bag, provided with leather straps. Used by anglers and sportsmen. Depth, 36 inches; width, 20 inches. New York, 1883. 57,663. U. S. Fish Commission.

ANGLER'S BAG.

Same as 57,663, but smaller. New York, 1880. 102,135. U. S. Fish Commission.

OIL-CLOTH COVER.

Piece of black oil-cloth used by anglers for wrapping up clothing and other material, to keep it dry in transportation. New York, 1883. 102,137. U. S. Fish Commission.

E.—FOOD, MEDICINE, AND SHELTER.

65. Food used by fishermen and anglers.

FRESH TOMATOES.

One case, two dozen 3-pound cans. Boston, Mass. Potter & Wrightington.

ROAST CHICKEN.

Two cases, each two dozen 2-pound cans. Boston, Mass. Potter & Wrightington.

ROAST MUTTON.

Two cases each, of 1-pound, 1½-pound, and 2-pound cans. Boston, Mass. Potter & Wrightington.

ROAST BEEF.

Two cases, each two dozen 2-pound flat cans. Boston, Mass. Potter & Wrightington.

ROAST BEEF.

Two cases each, of 1-pound, 1½-pound, and 2-pound cans. Boston, Mass. Potter & Wrightington.

VEAL CUTLETS.

Two cases, each two dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

PICNIC BEANS.

Boston baked beans, two cases, each four dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

BAKED BEANS.

Two cases, each two dozen 3-pound cans. Boston, Mass. Potter & Wrightington.

ROAST MUTTON.

In 2-pound cans. Boston, Mass. W. K. Lewis & Bros.

ROAST BEEF.

In 2-pound cans. Boston, Mass. W. K. Lewis & Bros.

ROAST TURKEY.

In 2-pound cans. Boston, Mass. W. K. Lewis & Bros.

ROAST CHICKEN.

In 2-pound cans. Boston, Mass. W. K. Lewis & Bros.

BAKED BEANS.

Half dozen 3-pound cans. Boston, Mass. L. Pickert & Co.

BOILED DINNER.

Prepared from beef and vegetables. Half dozen 3-pound cans. Boston, Mass. L. Pickert & Co.

ROAST TURKEY.

In 1-pound cans. Boston, Mass. Henry Mayo & Co.

TOMATO SOUP.

In round quart cans. Boston, Mass. Henry Mayo & Co.

ROAST LAMB.

In 1-pound cans. Boston, Mass. Henry Mayo & Co.

ROAST BEEF.

In 1-pound cans. Boston, Mass. Henry Mayo & Co.

FRESH TOMATOES.

In round quart cans. Boston, Mass. Henry Mayo & Co.

FRESH SUCCOTASH.

In round quart cans. Boston, Mass. Henry Mayo & Co.

FRESH SQUASH.

In round quart cans. Boston, Mass. Henry Mayo & Co.

GREEN PEAS.

In round quart cans. Boston, Mass. Henry Mayo & Co.

GREEN CORN.

In round quart cans. Boston, Mass. Henry Mayo & Co.

GREEN LAWNSDALE BEANS.

In round quart cans. Boston, Mass. Henry Mayo & Co.

GREEN LIMA BEANS.

In round cans. Boston, Mass. Henry Mayo & Co.

BAKED BEANS (bean-pot brand).

In round cans. Boston, Mass. Henry Mayo & Co.

PICNIC BEANS (bean-pot brand).

In round cans. Boston, Mass. Henry Mayo & Co.

ROAST CHICKEN.

In 1-pound round cans. Boston, Mass. Henry Mayo & Co.

CHICKEN SOUP.

In round cans. Boston, Mass. Henry Mayo & Co.

MACARONI SOUP.

In round cans. Boston, Mass. Henry Mayo & Co.

BEEF SOUP.

In round cans. Roston, Mass. Henry Mayo & Co.

OX-TAIL SOUP.

In round quart cans. Boston, Mass. Henry Mayo & Co.

MUTTON SOUP.

In round quart cans. Boston, Mass. Henry Mayo & Co.

PEA SOUP.

In round quart cans. Boston, Mass. Henry Mayo & Co.

"EVAPORATED" FOODS:

Codfish cakes or mince fish; mince meat for pies; beef; carrots; beef hash; potatoes; oysters; beets; clams, &c., in ¼- and ½-pound packages. The moisture is extracted from these articles by the "Alden Evaporating Process," and prepared in this manner the food will keep in any climate, and can be easily and quickly prepared for the table by simply adding a little water or milk, and allowing the articles to cook a few minutes. Charles Alden, Randolph, Mass.

66. FISHERMEN'S MEDICINES.

FISHERMAN'S MEDICINE-CHEST.

This chest is filled and ready for use. The contents are: 1, sulphur; 2, cream of tartar; 3, epsom salts; 4, arrow root; 5, chamomile flower; 6, flax-seed; 7, flax-seed meal; 8, bicarbonate of soda; 9, Turner's cerate; 10, mercurial ointment; 11, basilicon ointment; 12, simple ointment; 13, glycerine ointment; 14, extract of paregoric; 15, extract of vitriol; 16, laudanum; 17, Fryar's balsam; 18, essence of peppermint; 19, spirits of niter; 20, balsam copaiba; 21, sulphuric ether; 22, syrup of squills; 23, soap liniment; 24, spirits of lavender; 25, spirits of camphor; 26, spirits of hartshorn; 27, tincture of rhubarb; 28, tincture of bark; 29, wine of antimony; 30, mercurial solution; 31, muriatic tincture of iron; 32, Seidlitz mixture; 33, castor-oil; 34, purging pills; 35, gum arabic; 36, blue pills; 37, opium pills; 38, fever

FISHERMAN'S MEDICINE-CHEST—Continued.

powders; 39, calomel and jalap; 40, Dover's powders; 41, quinine; 42, ipecac; 43, calomel; 44, tincture of myrrh; 45, rhubarb; 46, magnesia; 47, Peruvian bark; 48, tartar emetic; 49, powdered cubebs; 50, nitrate of potash; 51, sugar of lead; 52, white vitriol; 53, blue vitriol; 54, tartaric acid; 55, red precipitate; 56, alum; 57, gum camphor; 58, iodide of potash; 59, lunar caustic; 62, lancet; 63, syringe; 64, the Mariner's Medical Guide. Gloucester, Mass. 1880. U. S. Fish Commission. Some vessels carry smaller chests than the one exhibited, though this is about a fair average of those carried by the first-class fishing schooners.

INDIAN MEDICINE.

Minnows (*Tigoma* sp.), called by the Indians, "shillah." Placer County, Cal. 21,423. Collected by S. Powers. It is pretended by the Indian doctor that this is a cure for diseases; so, after sucking the affected part a long time, he vomits up one of these minnows, and assures the patient that he will now recover. Nishimans Indians, Bear River.

67. PHOTOGRAPHS OF FISHERMEN'S HOUSES, BOARDING-HOUSES, FITTERS' AND FISH DEALERS' HOUSES, BETHELS, SCHOOL-HOUSES, VIEWS IN FISHING TOWNS, ETC.

FISHERMEN'S DWELLINGS.

FISHERMAN'S HOUSE.

View of a fisherman's house with fish-flakes, &c. Lubec, Me., 1882. (Photo. No. 1925.) U. S. Fish Commission.

FISHERMAN'S HOUSE.

View of a fisherman's cottage, 'Squam River, on the road from Essex to Gloucester. Dimensions of photograph, 4 by 7 feet. Gloucester, Mass., 1882. (Photo. No. 1963.) U. S. Fish Commission.

BOAT-FISHERMAN'S HOUSE.

View of the house of David Mahlman, East Gloucester boat-fisherman. Gloucester, Mass., 1882. (Photo. No. 2025.) U. S. Fish Commission.

FISHERMAN'S HOUSE.

View of fisherman's cottage on Niles's Beach, Eastern Point. Gloucester, Mass., 1882. (Photo. No. 2035.) U. S. Fish Commission.

BOAT-FISHERMAN'S HOUSE.

House of Robert Marston, East Gloucester boat-fisherman. This house is about ninety-six years old. Gloucester, Mass., 1882. (Photo. No. 2040.) U. S. Fish Commission.

FISHERMEN'S DWELLINGS.

Group of fishermen's houses on Babson's Hill. Gloucester, Mass., 1882. (Photo. No. 2051.) U. S. Fish Commission.

FISHERMAN'S COTTAGE.

Cottage of Capt. William Corliss, Forest street. Gloucester, Mass., 1882. (Photo. No. 2053.) U. S. Fish Commission.

INTERIOR OF FISHERMAN'S COTTAGE.

Parlor and dining-room in the house of Capt. William Corliss. Gloucester, Mass., 1882. (Photos. Nos. 2063 and 2064.) U. S. Fish Commission.

FISHERMAN'S COTTAGE.

House of Capt. Sewall Smith (haddock fisherman), Prospect street. Gloucester, Mass., 1882. (Photo. No. 2055.) U. S. Fish Commission.

FISHERMAN'S HOUSE.

House of Capt. Bernard A. Williams (Grand Bank fisherman), on Babson street. Gloucester, Mass., 1882. (Photo. No. 2047.) U. S. Fish Commission.

FISHERMAN'S HOUSE.

House of Capt. John Terry (mackerel fisherman), Hovey street. Gloucester, Mass., 1882. (Photo. No. 2048.) U. S. Fish Commission.

FISHERMEN'S HOUSES.

View of the cottages of Capt. Henry B. Thomas (on the left) and Capt. Levi McLain (on the right), on Mount Vernon street. Gloucester, Mass., 1882. (Photo. No. 2061.) U. S. Fish Commission.

FISHERMEN'S DWELLINGS.

Row of fishermen's cottages on Maple street. Gloucester, Mass., 1882. (Photo. No. 2062.) U. S. Fish Commission.

WHALEMAN'S HOUSE.

Residence of Capt. Humphrey Seabury. New Bedford, Mass., 1882. (Photo. No. 2138.) U. S. Fish Commission.

WHALEMAN'S HOUSE.

Residence of Capt. James V. Cox. New Bedford, Mass., 1882. (Photo. No. 2139.) U. S. Fish Commission.

FISHERMEN'S BOARDING-HOUSE.

The "Anderson House," Friend street, Gloucester. This is a fishermen's boarding-house, and is owned by Captain Anderson, himself a fisherman. Gloucester, Mass., 1882. (Photo. No. 2056.) U. S. Fish Commission. The prevailing rule in Gloucester is for all of the fishermen to stay on shore while the vessels are in port. Those who do not have homes go to boarding-houses, of which there is a large number in the port.

FISHERMEN'S BOARDING-HOUSE.

Fishermen's boarding-house at East Gloucester, kept by Mrs. Samuel Giles Wonson. Gloucester, Mass., 1882. (Photo. No. 2108.) U. S. Fish Commission.

WHALEMEN'S BOARDING-HOUSE.

Mariner's House. New Bedford, Mass., 1882. (Photo. No. 2135.) U. S. Fish Commission.

HOMES FOR FAMILIES OF LOST FISHERMEN.

FISHERMEN'S WIDOWS TENEMENT HOUSE.

View of the Gloucester tenement house for fishermen's widows. Built about 1870, on 'Squam River. It has ten tenements of three rooms each in five houses. Rent of each tenement, $3 per month. Gloucester, Mass., 1882. (Photo. No. 2046.) U. S. Fish Commission.

DWELLINGS OF OWNERS OF FISHING VESSELS, FISH-DEALERS, ETC.

VESSEL-FITTER'S HOUSE.

House of William H. Jordan, Babson's Hill. Gloucester, Mass., 1882. (Photo. No. 2048.) U. S. Fish Commission.

VESSEL-FITTER'S HOUSE.

House of J. O. Proctor, jr., Babson's Hill. Gloucester, Mass., 1882. (Photo. No. 2050.) U. S. Fish Commission.

VESSEL-FITTER'S HOUSE.

House of Capt. Sylvanus Smith (formerly a fisherman), Prospect street. Gloucester, Mass., 1882. (Photo. No. 2059.) U. S. Fish Commission.

FISH-DEALER'S HOUSE.

House of Capt. Samuel Pool (formerly a fisherman), on Prospect street. Captain Pool is a dealer in fresh fish, halibut being a

FISH-DEALER'S HOUSE—Continued.

specialty. Gloucester, Mass., 1882. (Photo. No. 2060.) U. S. Fish Commission.

VESSEL-FITTER'S OFFICE AND DWELLING.

View of office of John Pew & Son, and residence of Capt. John Pew. Gloucester, Mass., 1882. (Photo. No. 2095.) U. S. Fish Commission.

FISH-DEALER'S HOUSES.

Corner of Pleasant and Prospect streets, Gloucester; view of residences of George Perkins (on the left), B. A. Baker and George H. Perkins (on the right). Gloucester, Mass., 1882. (Photo. No. 2111.) U. S. Fish Commission.

BETHELS.

SEAMEN'S BETHEL.

New Bedford, Mass., 1882. (Photo. No. 2144.) U. S. Fish Commission.

A GLOUCESTER GRAMMAR SCHOOL.

View of the Sawyer school-house on Friend street. This is one of the Gloucester grammar schools, attended chiefly by the children of fishermen. Gloucester, Mass. 1882. (Photo. No. 2057.) U. S. Fish Commission.

VIEWS IN FISHING TOWNS.

MAIN STREET, GLOUCESTER.

View, looking down Main street, southwest, from Fishing Insurance building. Gloucester, Mass., 1882. (Photo. No. 2098.) U. S. Fish Commission. This is the principal business street of Gloucester.

MAIN STREET, GLOUCESTER.

Main street, looking westerly from the Belmont House. Gloucester, Mass., 1882. (Photo. No. 2112.) U. S. Fish Commission.

BANK BUILDINGS, &c.

Gloucester National Bank building and adjoining buildings on Main street, from post-office. Gloucester, Mass., 1882. (Photo. No. 2099.) U. S. Fish Commission.

MIDDLE STREET, GLOUCESTER.

View, looking east, on Middle street. Gloucester, Mass., 1882. (Photo. No. 2100.) U. S. Fish Commission.

MIDDLE STREET, GLOUCESTER.

View, looking west, on Middle street. Gloucester, Mass., 1882. (Photo. No. 2101.) U. S. Fish Commission.

68. ANGLERS' TENTS AND PORTABLE HOUSES, AND THEIR EQUIPMENTS.

ANGLERS' TENT.

Heavy canvas drilling. Dimensions: Seven feet square, accommodating three men. Portable bamboo poles. Weight, with poles, 15 pounds. Value, complete (1882), $12. Devised by Wakeman Holberton, esq., New York.

ANGLERS' TENT.

Portable shelter-tent, open front, with curtain. Dimensions, 6 feet by 7 feet. 42,834. U. S. Fish Commission.

SET OF TENT-POLES.

Five pieces, bamboo, pointed. Each section 3 feet 10 inches long. U. S. Fish Commission. 57,661. Used for supporting tent.

PORTABLE WOODEN HOUSE.

In three sections; adjustable. Dimensions: 7½ feet wide, 9 feet 10 inches long. U. S. Fish Commission. 57,629. Used for camping by lakes and streams.

CAMP-KETTLE AND CONTENTS.

Kettle: tin; tubular; flat-bottom; stout wire handles; tin cover. Contents: Inside pail (57,632); six tin plates (57,633); six knives (57,634); six forks (57,635); six tea-spoons (57,636); six table-spoons (57,637); one tin wash-basin (57,638). Height, 13 inches; diameter, 12½ inches. U. S. Fish Commission. 57,631 to 57,638.

CAMP-CHAIR.

Folding wooden frame, including back. Canvas seat. Height, 30 inches. U. S. Fish Commission. 57,639.

CAMP-LOUNGE.

A folding easy-chair. Wooden frame; blue and white striped canvas seat and back. Total height, 30 inches. U. S. Fish Commission. 57,640.

CAMP-STOOL.

Folding wooden frame, canvas seat. Height, 18 inches. U. S. Fish Commission. 57,641.

FOLDING CAMP-BED.

Wooden, adjustable frame; brown canvas cover. Length, 6 feet; width, 2 feet; height, 1 foot. U. S. Fish Commission. 57,642.

POCKET HAMMOCK.

Made of drab-colored linen twine. Screw-rings and lines for hanging hammock. Black enamel-cloth cover. U. S. Fish Commission. 57,643.

WOOLEN CAMP-BLANKETS.

One pair. Drab color ground-work, blue-striped border. Size, 7½ by 6 feet. U. S. Fish Commission. 57,644.

RUBBER CAMP-BLANKET.

Made of black rubber-cloth. Two eyelets at bottom; round neck. Size, 5½ by 4 feet. U. S. Fish Commission. 57,647.

RUBBER AIR-PILLOW.

Made of white rubber-cloth (No. 2, Standard Rubber Works, New York). Dimensions, 16 bv 11 inches. U. S. Fish Commission. 57,648.

BLANKET-RACK.

A rack made of leather, stretched on wooden frame, with pads for shoulders and hips, and straps for holding blankets, &c. Height, 28 inches. U. S. Fish Commission. 57,669. Used by anglers and hunters for carrying blankets and clothing.

POCKET-FLASK.

Glass, covered with Russia leather. Tin cup fits on bottom of flask. Metal cover; screw held secure with metal in the neck of the flask without plaster or composition, prevents all leakage. M. V. Olny, patentee. Dimensions: Depth, 7¼ inches; diameter, 3¾ by 1⅓ inches. U. S. Fish Commission. 57,645.

ANGLER'S LANTERNS.

No. 1. Excelsior jack, dash, fishing lamp, and hand lantern, for night fishing and hunting and other purposes, with cap or cover for obscuring the light when necessary; burns kerosene oil.

No. 1 A. Socket attachment for adjusting the lamp to a stick or pole in the bow of a boat or canoe.

No. 1 B. Fishing reflector for night fishing, and for reading and writing at night when in camp; is adjusted to the face of the lamp by the hinge pin, the cap or cover being first removed.

No. 1 C. Adjustable dash attachment by which the lamp can be applied to any shaped leather wagon dash, and to any part thereof.

No. 1 D. Adjustable bracket attachment used in place of the dash clamp, by which the lamp can be applied to a wooden wagon dash, pillar, or bow of a top vehicle, side of a house, &c.

ANGLERS' LANTERNS—Continued.

No. 2. Universal reflecting lamp, for night fishing and hunting and general illuminating purposes; combines head jack, boat jack, fishing lamp, camp lamp, dash lamp, belt lamp, and hand lantern, with cap or cover for obscuring the light when necessary; burns signal oil.

No. 2 A. Socket attachment for adjusting the lamp to a stick or pole in the bow of a boat or canoe.

No. 2 B. Fishing reflector for night fishing, and for reading and writing at night when in camp; is adjusted to the face of the lamp by the hinge pin, the cap or cover being first removed.

No. 2 C. Head attachment for adjusting the lamp to the front of the head—worn over the hat.

No. 2 D. Head attachment for adjusting the lamp to the top of the head—worn over the hat.

No. 2 E. Adjustable dash attachment by which the lamp can be applied to any shaped leather wagon dash, and to any part thereof.

No. 2 F. Adjustable bracket attachment, used in place of the dash clamp, by which the lamp can be applied to a wooden wagon dash, pillar, or bow of a top vehicle, side of a house, &c. By means of the folding handles at the back, this lamp can be used as a hand lantern, and by means of the loop as catch, above the handles, the lamp can be hung in any desired position.

Prices: Excelsior jack lamp, including reflector and attachments, $7.75; universal lamp, with reflector and attachments, $10.25.

Albert Ferguson, 65 Fulton street, New York City.

DASH-LAMP. (Ferguson's Excelsior.)

Japanned tin; silvered reflector; wooden handle at top. Height (exclusive of handle), 1 foot; greatest width (including reflector), 11 inches. U. S. Fish Commission. 57,646.

ANGLER'S COMPANION.

For salt-water fishing. Tin box, 8 by 4 by 1¼ inches. Contents: 1 pair wire-cutters, 1 pair pincers, 1 corkscrew, 1 oil-feeder, 1 gimlet, 2 files. U. S. Fish Commission. 57,649.

ANGLER'S COMPANION.

For fresh-water fishing, with tools complete. Tin box, 8 by 4 by 1¼ inches. Contents: 1 pair nippers, 1 file, 1 oil-feeder, 1 gimlet, 1 pair scissors, 1 corkscrew. U. S. Fish Commission. 57,650.

ANGLER'S SUN-SHADE. (Ray's patent.)

Cloth (drab outside, green inside) stretched over a wire framework, forming a sort of inverted scoop-shaped shade, which is connected by cords and wire to a framework which is adjusted to the shoulders and body of the wearer. Dimensions, 26 by 16 inches. U. S. Fish Commission. 57,653. Used by sportsmen and anglers.

TAR-OIL.

In two-ounce vial. U. S. Fish Commission. 57,655. Used for repelling mosquitoes, &c.

INSECT-REPELLANT.

In two-ounce bottle. U. S. Fish Commission. 57,656. Used for repelling insects, mosquitoes, &c.

BOX OF FERGUSON'S WATER-PROOFING.

U. S. Fish Commission. 57,657. Used for boot and shoe dressing.

CROSBY CAMP-AX AND BELT.

Polished steel blade, $4\frac{1}{2}$ by $2\frac{1}{2}$ inches. Wooden handle, 13 inches long. Patent brass sheath attached to leather belt. U. S. Fish Commission. 57,658. Used by sportsmen to cut fuel for camp, and for various other purposes.

WATER-JUG.

One gallon size. Earthenware. U. S. Fish Commission. 57,664. Used for holding supply of water for campers.

DRAG-ROPE.

Piece of rope 15 feet long, with three bamboo handles (16, 28, and 32 inches long, respectively) fastened to the rope at intervals of 4 feet. To one end of the rope is attached an iron-wedge $5\frac{1}{4}$ inches long by $1\frac{1}{4}$ inches wide. U. S. Fish Commission. 57,665. Used to haul logs for firewood into camp, the wedge being driven into the end of a log $2\frac{1}{2}$ to 3 inches, and the handles being so arranged that several men can pull together.

CAMP STOVE No. 0, COMPLETE, WITH EQUIPMENT.

Stove of sheet-iron with handle; oval-shaped when packed; flat bottom. Height, 13 inches; diameter, 10 by 15 inches; weight, about 20 pounds. Boston, Mass. (H. H. Dunckle patent). 57,665. U. S. Fish Commission. Equipment or contents—1 tin boiler, $8\frac{1}{2}$ inches deep, 12 inches wide, with wire handle; 1 tin pail, 9 inches deep, 12 inches wide; 2 broad oval-shaped pans, $10\frac{1}{2}$ inches long, 8 inches wide, 2 inches deep; 1 coffee-pot, 6 inches deep, $5\frac{1}{2}$ inches diameter at bottom, $3\frac{3}{4}$ inches diameter

CAMP STOVE NO. 0, COMPLETE, WITH EQUIPMENT—Continued.

at top; 3 tin cups; 1 tea-kettle; 1 tin flange; 1 bread-toaster; 6 sections stove-pipe, 11½ by 3 inches; 3 stove lids; 3 pairs holders; 1 lifter.

POCKET-FILTER.

U. S. Fish Commission. 57,666.

PACK-BASKET.

Made of fibers of hard wood woven together; oval shaped, bulging sides, flat top and bottom. Leather shoulder-strap. Height, 20 inches; diameter of top, 18 by 10 inches. U. S. Fish Commission. 56,942. Used for carrying portions of camp outfit.

TOBACCO.

Four pieces McAlpin's tobacco for camp use. Length of pieces, 12 inches. Joseph Willits. 57,668.

SKETCHES OF FISH ON BIRCH-BARK AND PAPER.

New York. 57,667. Gift of Conroy & Bissett.

ANGLERS' FOODS.

Can of roast beef. 57,591. Can of roast veal. 57,592. Can of potted beef. 57,593. Can of potted ham. 57,594. Can of potted chicken. 57,595. Can of rolled ox-tongue. 57,596. Can of sugar-cured tongue. 57,597. Can of lunch ham. 57,598. Can of lunch tongue. 57,599. Can of roast chicken. 57,600. Can of whole roast duck in jelly. 57,614. Can of boned turkey. 57,615. Can of boned chicken. 57,616. Can of succotash, 57,617. Can of lobster. 57,618. Can of plum pudding. 57,619. Can of green corn. 57,620. Package of Hecker's self-raising flour. 57,621. Package of Hecker's self-raising buckwheat. Six pounds. 57,623. Package of Hecker's hominy. Three pounds. 57,624. Package of Hecker's oatmeal. Three pounds. 57,625. Package of wheaten grits. Three pounds. 57,626. Package of farina. One pound. 57,627. Can of baking powder. One pound. 57,628. U. S. Fish Commission.

F.—VESSELS' PAPERS AND OTHER DOCUMENTS.

69. Vessels' papers, insurance policies, log-books of fishing voyages; papers of Gloucester Seamen's and Fishermen's Widows and Orphans Aid Society.

Fishing schooner's papers.

Copies of papers carried by the fishing schooner James A. Garfield, of Gloucester, Mass. Fishing shipping paper, containing crew list and agreement between owners and fishermen. Certificate of enrollment. License for enrolled vessel. Circular from the Treasury Department, containing steering and sailing rules, lights, torches, and fog-signals. Synopsis of laws regulating the coasting trade. Gloucester, Mass., 1883. 56,835, 56,839. Gift of Capt. Fitz J. Babson, collector of the port of Gloucester.

Insurance policy.

Copy of policy of the schooner James A. Garfield, Gloucester, Mass., issued by the Gloucester Mutual Fishing Insurance Company. Gloucester, Mass., 1883. 56,840. Gift of Capt. Fitz J. Babson.

Box for vessel's papers.

Tin, unpainted; common form of box carried on fishing trips from New England as a receptacle for the vessel's papers. Dimensions: $10\frac{3}{4}$ by $4\frac{1}{2}$ inches. Gloucester, Mass., 1883. 56,834. Gift of Capt. Fitz J. Babson, collector of the port of Gloucester.

Insurance office.

Photographic view of the Gloucester Mutual Fishing Insurance Company's building. Gloucester, Mass., 1882. (Photo. No. 2097.) U. S. Fish Commission.

70. Log-books.

KEPT BY MASTERS OF NEW ENGLAND COD-VESSELS UNDER THE REQUIREMENTS OF THE OLD BOUNTY LAW.

Journal.

Journal of cod-fishing voyage to Western Bank in schooner Day-Spring, of Chatham, Mass., April 15 to September 9, 1853. By Capt. David T. Bassett. 56,846.

JOURNAL.

Journal of cod-fishing voyage to Western Bank in schooner General Taylor, Capt. Levi Taylor, of Chatham, Mass., April 27 to September 11, 1860. By Capt. Levi Taylor. 56,844. Aggregate of fish taken 24,680; crew of eight men.

JOURNAL.

Journal of cod-fishing voyage to Sable Island Bank (Western Bank), in schooner Mary A. Taylor, Capt. Henry D. Bassett, of Harwich, Mass., April 24 to August 31, 1860. By Frederick A. Harding. 56,845. A record of the number of fish taken gives the total of 33,255, with a crew of eight men, all told.

JOURNAL.

Journal of cod-fishing trip to Nantucket Shoals in schooner R. Fowler, of Dennis, Mass., Capt. Isaac Bassett, from April 5 to April 15, 1854. By Watson Baker. 56,847.

KEPT BY FISHERMEN AT THE REQUEST OF THE UNITED STATES FISH COMMISSIONER.

JOURNAL.

Journal of cod-fishing trip to Grand Bank in schooner Ocean King, of Gloucester, Mass., from Saturday, May 24, 1879, to Wednesday, August 27, 1879. By George W. Scott. 56,841. The incidents of the passages to and from the Bank, the daily catch of fish, &c., are given.

JOURNAL.

Journal of a season's mackerel fishing in schooner Albert H. Harding, of Gloucester, Mass.; cruising ground from capes of Delaware to coast of Maine, from April 14 to October 22, 1880. By Edward O. Brown. 56,842.

JOURNAL.

Journal of a season's menhaden fishing in steamer George H. Bradley, of New Bedford, Mass., April 9, to October 15, 1880. By J. F. Fowles, engineer. 56,843. The cruising ground was chiefly in Long Island Sound.

71. PAPERS OF THE GLOUCESTER FISHERMEN'S AND SEAMEN'S WIDOWS AND ORPHANS AID SOCIETY.

CONSTITUTION.

The constitution of the Gloucester Fishermen's and Seamen's Widows and Orphans Aid Society. Organized March 1865. Contains a preamble, fifteen articles, and the names of the officers. Gloucester, Mass., 1883. 76,028. Gift of J. O. Proctor.

CERTIFICATE.

Sample of the certificates issued by the society in 1863. This certificate, which has a small engraving at its head, representing navigation, reads as follows: "This certifies that —— —— has paid for the year 186–, the sum of one dollar towards the fund for the relief of seamen's widows and orphans and disabled seamen. Issued by order of the Widows' and Orphans' Relief Committee. ———— ———— treasurer. Gloucester, Mass." Gloucester, Mass., 1883. Gift of Joseph O. Proctor.

ANNUAL STATEMENTS.

Showing the receipts, disbursements, and other business of the society. Statement for 1877. 76,024. Statement for 1879. 76,025. Statement for 1880. 76,026. Statement for 1881. 76,027. Gloucester, Mass., 1883. Gift of J. O. Proctor.

G.—HABITS OF FISHERMEN.

72. Musical instruments, games, and literature of the fishermen.

MUSICAL INSTRUMENTS.

Collection of musical instruments, song and music books.

Accordion, violin, harmonica, music book, and fishermen's ballads. This collection represents the musical instruments, &c., most commonly carried on fishing vessels.

GAMES.

Cards.

Pack of cards which have been used on fishing vessel Reporter, of Gloucester, Mass., 1883.

Fishermen's checker-board.

A half-barrel head, with checker-board marked with red chalk on one side. Checkers made of a piece of an old boot-leg. Gloucester, Mass., 1883. 57,949. Gift of Capt. J. W. Collins. These are easily improvised, and are the kind of checker-boards most commonly used.

Canvas checker and backgammon boards.

A piece of canvas, hemmed on the ends, with a checker-board painted on one side and a backgammon-board on the other. 22 inches square. Gloucester, Mass., 1883. 56,832. U. S. Fish Commission. Canvas checker and backgammon boards are often carried on fishing schooners.

Fox and geese board.

A plain, square piece of board, with 32 holes; 19 pegs for geese and 1 peg—the longest—for the fox. Board 9 inches square. Gloucester, Mass., 1883. 57,950. Gift of Capt. George Merchant, jr.

Diamond puzzle.

Six small pieces of wood notched so that when put together each binds all the rest. Gloucester, Mass., 1883. 56,831. Gift of Capt. George Merchant, jr. Used to pass away idle time on fishing vessels when making passages, &c. The puzzle consists in putting the blocks together in the right positions.

CROSS PUZZLE.

Six oblong blocks of hard wood ingeniously notched so that they can be put together in such a manner that one binds the whole; the puzzle is to do this. Gloucester, Mass., 1883. 56,829. Gift of Capt. George Merchant, jr. This is considered one of the most difficult puzzles made or used on fishing vessels.

ROW-GALLEY PUZZLE.

A frame-work of wood, consisting of two side-pieces and four cross-bars, the two end-bars having holes in them; rove through and hitched around these is a piece of double line. The puzzle is to unmoor or remove the line from the frame-work without using the free ends. This is called "unmooring the row-galley." Gloucester, Mass., 1883. 56,830. Gift of Capt. George Merchant, jr.

RING PUZZLE.

Consists of an iron ring separated in one place, and having an endless string attached by a "round" turn around the ring. The puzzle is to get the string clear without unwinding it directly. Gloucester, Mass., 1883. 56,827. Gift of Capt. George Merchant, jr.

WOODEN TOP.

Ash; pointed base; square sides in the middle; round handle at top. Letters A, N, P, and T. on the squares. Gloucester, Mass., 1883. 56,826. Gift of Capt. George Merchant, jr. This is used to play for buttons, cents, &c., by the crews of fishing vessels. Each player spins it in turn, and if it falls with "A" up he takes all the stakes; with "N" he gets nothing; "P" up he puts down; and with "T" up he takes the stake he ventured.

RATTLE.

Several flat shells strung on a withe made of a cedar or spruce twig. Diameter of withe, 7½ inches. Neah Bay, Washington Territory. 1,034. Collected by James G. Swan.

LITERATURE.

FISHERMEN'S LITERATURE.

Collection of works of fiction. Loss of the Grosvenor, &c., by W. Clark Russel; Peter Simple, and other stories by Marryatt, &c. Gloucester, Mass., 1883. U. S. Fish Commission.

FISHERMEN'S MEMORIAL AND RECORD BOOK.

The Fishermen's Memorial and Record Book, containing an account of the losses of fishing vessels and fishermen, hair-breadth es-

FISHERMEN'S MEMORIAL AND RECORD BOOK—Continued.

capes, big fishing trips, &c. Gloucester, Mass., 1872. Proctor Brothers, Gloucester, Mass.

FISHERMEN'S OWN BOOK.

The Fishermen's Own Book, of the same style as the Memorial and Record Book, contains in addition stories of thrilling experiences, poetry, &c., written by fishermen. Brings the record of the fisheries down to 1882. Gloucester, Mass., 1882. Proctor Brothers, Gloucester, Mass.

NEWSPAPERS.

Collection of the local papers, Cape Ann Advertiser and Cape Ann Bulletin, published in Gloucester, also several of the Boston daily papers. Gloucester, Mass., 1883. U. S. Fish Commission.

73. FISHERMEN'S TOOLS AND OUTFITS.

SAILMAKER'S PALM.

Leather, with steel thimble. Middletown, Conn. 54,736. Wilcox, Crittenden & Co. Used for sewing sails, &c.

SAILMAKER'S PALM.

Leather strap to fit around the right hand and thumb, with steel thimble fastened on. Middletown, Conn. 54,737. Wilcox, Crittenden & Co. Used in making sails, &c.

SAILMAKER'S PALM.

Leather and steel. Made to fit right hand. Middletown, Conn. 54,738. Wilcox, Crittenden & Co. Used on the right hand for forcing sail-needles through canvas when making sails.

SAILMAKER'S BENCH HOOKS.

Old style of sailmakers' bench hooks (2 specimens). Middletown, Conn., 1882. 54,326. Wilcox, Crittenden & Co.

SAILMAKER'S BENCH HOOK.

New style of sailmaker's bench hook. Middletown, Conn., 1882. 54,327. Wilcox, Crittenden & Co.

COOK'S WHISTLE.

Gloucester, Mass., 1883. 54,696. U. S. Fish Commission. Used commonly by cooks of fishing vessels to call the fishermen to their meals.

COOK'S BELL.

An ordinary hand-bell with wooden handle. Height, 10 inches; diameter of mouth, 6 inches. Gloucester, Mass., 1883. 54,697.

COOK'S BELL—Continued.

U. S. Fish Commission. In common use on fishing vessels for calling the crew to their meals.

SNOW CANE.

A slender wooden staff about one inch in diameter, with a projecting handle-piece; a circular piece of bone interlaced and lashed with sealskin thongs fits over and is lashed to an ivory peg inserted in the recessed tip of the cane; the tip of cane is served with strips of seal-skin. Length, 48 inches. Cape Nome, Alaska. 45,424. Collected by E. W. Nelson. Used by travelers when walking with snow-shoes.

DITTY-BOX.

Pine wood veneered with walnut. U. S. Fish Commission. 57,893. This was the ditty-box of one of the crew of schooner Grace L. Fears, of Gloucester, Mass. The contents are shown with it from No. 57,894 to No. 57,923, inclusive. Contents of ditty-box: 1 broken dory-compass; 1 spray of tree coral; 1 bunch of buttons; 3 spools of thread; 2 thimbles; 1 account-book and pencil; 1 shark's tooth; 4 matches; 1 brierwood pipe; 1 broken clay pipe; 1 whetstone; 1 pair scissors; 1 suspender-buckle; 1 palm thimble; 2 rolls beeswax; 2 line-splicers; 2 "hurdy-gurdy" screws; 1 jig-rasp; 1 file for sharpening hooks; 2 needles for sewing gear; 1 piece of pipe-stem; 2 "lucky cents" (one American, one British Provincial); 1 clothes-hook; 2 tobacco-knives; 3 slot-swivels; 1 brass swivel; 1 mackerel-splitting knife; 1 piece cotton cloth for mending oil clothes; 1 ball woolen yarn and needle; lot of screws and tacks.

IMPROVISED DITTY-BOX.

A rough oblong wooden box without cover. This was improvised from some empty salt-box or something similar in which the cook had brought stores on board the vessel. Gloucester, Mass., 1883. 57,924. Gift of Peter Nelson, of schooner Grace L. Fears, Gloucester. The contents are shown with it, from No. 57,925 to 57,946, inclusive. Contents of ditty-box: 1 grommet-ring; 1 pair scissors; 1 suspender-strap; 2 pieces of rubber cloth for mending; 1 horn needle-case; 5 sewing-needles; 1 cod-hook; 2 shirt-buttons; 10 old nails, a screw and tacks; 5 broken clay pipes; 2 halibut trawl-hooks; 2 trawl-beckets; 1 thimble; 2 pieces pipe-stem; 2 line-splicers; 1 file; 1 spool black thread and needles; 2 "hurdy-gurdy" screws; 3 swivels for trawl and hand line; 1 bunch of buttons; 1 spray of tree coral; 1 palm for sewing.

H.—LIFE-SAVING MATERIAL, ETC.

74. LIFE-BOATS, RAFTS, AND MATTRESSES.

LIFE BOAT.

Model of Higgins & Gifford's life-saving surf-boat; scale, 2 inches to foot. Sharp forward and aft; round bilge; carvel-built; good sheer; air-chambers forward and aft; air-tight cylindrical cases underneath thwarts on each side. Gloucester, Mass., Higgins & Gifford. This model represents a style of life-saving surf-boat built by Messrs. Higgins & Gifford, of Gloucester, Mass., which has been used with much success in rescuing crews and passengers from stranded vessels on the Great Lakes and along the Atlantic coast.

LIFE-RAFT.

Model. Patented April 26, 1881. Made of frames attached to empty casks, provided with oars, masts, tent, &c. "The strings attached to the man-holes are to be lashed across to prevent anything from coming out." Frederick S. Allen, Cuttyhunk, Mass. This invention is designed to be carried on board of vessels, and to be used in case of stranding or foundering at sea.

HOLMES'S LIFE-PRESERVING MATTRESS AND BERTH.

"A life-preserving mattress inclosed in a berth, which is movable, and answers the four functions of a bed, boat, life-preserver, and, when a number of them are lashed together, they make a very formidable raft. Each berth is supplied with an extra cord or line, to be thrown to any one in distress, or to lash the berths together when forming a raft, and each berth has a pair of oars for the purpose of propelling the same. In case of an accident the berth is drawn out with its contents and dropped or lowered overboard. The buoyancy is very great. The mattress, containing solid cork and cork shavings, will support the largest person in the water. There is also a central hole in the center of the mattress, through which the occupant can go and seat himself or herself on a saddle underneath, which throws all the upper part of the body out of the water and gives the person the free use of the oars, which are chained fast to the berth. The whole device weighs from 32 to 35 pounds; is the full size of a berth, and it slides on cleats in the state-room the same as a drawer. This invention has been adopted as a life-preserver by the United States Board of Supervising Inspect-

HOLMES'S LIFE-PRESERVING MATTRESS AND BERTH—Continued.

ors of Steamboats, and resolutions have been adopted by the boards of trade and chambers of commerce and maritime exchanges of the principal cities of the United States, among which are New York, Boston, Philadelphia, Chicago, Saint Paul, Cincinnati, Saint Louis, and Detroit, and has the hearty indorsement of practical vessel-owners in all of these cities."—*M. H. Holmes*, 226 N. Fourth street, Philadelphia, Pa.

LIFE-SAVING MATTRESS.

Ostermoor's life-saving mattress, for use on board of steamers, sailing vessels, &c. H. D. Ostermoor & Son, 36 Broadway, New York City.

75. ILLUSTRATIONS, MEDALS, REPORTS.

SKETCHES.

Original sketches from which were engraved the illustrations of the The Century article upon the United States Life-Saving Service: 1, Off to a wreck; 2, Life-saving station; 3, Drill, &c., in surf-boat; 4, Launching surf-boat; 5, Night patrol; 6, Burning a signal; 7, Hauling mortar-car; 8, Surfman with life-belt; 9, Firing the mortar; 10, Breeches-buoy in operation; 11, Breeches-buoy; 12, Self-righting life-boat; 13, Self-righting life-boat under sail; 14, Life-saving dress; 15, Tally-board and whip-block; 16, Resuscitation, ejecting water; 17, Resuscitation, restoring respiration; 18, Medicine-chest; 19, Mess-room.

Other sketches for illustration of marine subjects: 1, A glimpse of the sun; 2, Hove to for a pilot; 3, Launching the boat; 4, Taking a porpoise aboard; 5, Sebatis in a perilous condition; 6, Beaching the canoe; 7, Reefing the mainsail. (The Century Company, New York City, art department, A. W. Drake, superintendent.)

PHOTOGRAPH OF RELIEF HOUSE.

Building of the Massachusetts Humane Society, No. 5, Bearskin Neck. Rockport, Mass., 1882. (Photo. No. 1,834.) U. S. Fish Commission.

MEDALS.

Medals for life-saving service granted by the Massachusetts Humane Society. Boston, Mass.

REPORTS.

Reports of the Massachusetts Humane Society. Boston, Mass.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

J.

CATALOGUE

OF THE

APPARATUS FOR THE CAPTURE OF FISH

EXHIBITED BY THE

UNITED STATES NATIONAL MUSEUM.

BY

R. EDWARD EARLL,

CURATOR OF THE FISHERIES COLLECTIONS, U. S. NATIONAL MUSEUM, AND
ASSISTANT U. S. FISH COMMISSION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

825

TABLE OF CONTENTS.

A.—APPARATUS OF DIRECT APPLICATION.

I.—Hand Implements.

* FOR STRIKING.

	Page.
1. Unarmed clubs	9
Seal clubs	9
Fish clubs	9
Drawings illustrative of fisheries in which clubs are employed	10

** FOR CUTTING.

2. Knives	10
Aboriginal knives	10
Sheath knives	12
Modern fish-knives	13
Rimming knives or plows	19
Scrapers and inshaves	20
Net-mender's knives	21
3. Axes and cutting spades	21
Axes proper	21
Spades	21
Clam and bait choppers	22

*** FOR THRUSTING.

4. Thrusting-spears and prods	23
Lances	23
Prodding instruments	26

II.—Implements for Seizure of Objects.

5. Scoops	27
Shovels	27
Dip-nets	27
Dredges	30
Smooth dredges	30
Toothed dredges and rakes	32

* The classification here adopted is, with a few unimportant exceptions, that devised by Prof. G. Brown Goode, and employed by him in his catalogue of the Government exhibit at the Centennial Exhibition at Philadelphia in 1876 of apparatus for the capture of animals; and in his catalogue of the fishery apparatus exhibited by the United States at the Berlin Fisheries Exhibition in 1880.

Page.
6. Grasping implements 33
Tongs 33
Nippers 34
7. Hooked instruments (those used with a single motion, that of hooking).. 35
Single-pointed hooks 35
Gaff-hooks 35
Fish sounders 38
Many-pointed hooks 38
Fish forks or pews 38
Squid forks 39
Many-pointed fish jigs 39
Oulachon rakes 39
Squid jigs 39
8. Barbed implements (those used with two motions, the first that of thrusting) 41
Spears with fixed heads 41
Single-pointed spears 41
Many-pointed spears 41
Aboriginal fish-spears 43
Spears with detachable heads 47
Lilly-irons 47
Modern harpoons 49
Aboriginal harpoons 49
Photographs and drawings illustrative of the use of spears and harpoons 66
9. Tangles 67

B.—APPARATUS OF INDIRECT APPLICATION.

III.—Missiles.

* SIMPLE MISSILES.

(Those propelled by the unaided arm.)

10. Hurled spears 68
Darts and lances 68

** CENTRIFUGAL MISSILES.

(Propelling power augmented by the artificial increase of the length of the arm.)

11. Missiles propelled by throwing-sticks 68
Spears and throwing-sticks 68

*** MISSILES PROPELLED BY A SPRING.

12. Bows and arrows 71
Fishing bows and arrows 71

**** MISSILES PROPELLED BY EXPLOSIVES.

13. Guns 78

Shoulder guns (See Section E—"The Whale Fishery and its appliances.") 78

Swivel guns (See Section E—"The Whale Fishery and its appliances.") 78

IV.—Baited Fish-hooks, Angling Tackle, &c.

	Page.
14. Hooks with movable lines. Hand tackle	78
Tackle for surface fishing	78
Angler's tackle for fly-fishing	78
Trolling tackle	78
Paintings and photographs illustrative of angling	78
Surf tackle for throwing and hauling	80
Drawings illustrating the use of surf tackle	80
Bluefish tackle	81
Tackle for fishing below the surface	81
Short hand-gear	81
Deep-sea hand-gear	82
Photographs, drawings, and paintings illustrative of the hand-line fisheries	89
15. Hooks with stationary lines. Set tackle	91
Bottom set lines	91
Trawl or long lines	91
Photographs and sketches illustrative of the trawl fisheries	93
16. Parts and accessories of angling and deep-sea fishing-tackle, and of harpooning implements	95
Hooks	95
Aboriginal hooks	95
Modern hooks, plain	100
Modern hooks, decorated (those partially covered with artificial animals, feathers, bright-colored cloth, or metal spoons and spinners, or other devices for alluring the fish and causing them to take the hook)	104
Fishing-lines and snoods	122
Sinkers	136
Swivels	138
Floats	139
Reels	141
Line-holders	149
Grapnels	150
Rods	150
Disgorgers and clearing-rings	158
Fish-baskets	159
Live boxes	159
Cleaning brooms	161
Lamps and lanterns	161
Sealer's accessories	161
Angler's camping outfit	161

C.—APPARATUS TO A GREATER OR LESS EXTENT AUTOMATIC.

V.—Nets.

17. Entangling nets	163
Meshing-nets	163
Fixed nets	163
Drift nets	165
Photographs and drawings illustrative of the gill-net fisheries	165
Pocket-nets	168

Page.
18. Encircling nets 168
Haul-seines 168
Photographs and drawings illustrative of the haul-seine fisheries. 170
Trailing-nets 172
Pursing-nets 172
Photographs and drawings illustrative of the purse-net fisheries.. 172
Lifting-nets 175
19. Parts of nets and apparatus of manufacture and preservation 176
Accessories to purse-seines 176
Netting 177
Net-maker's tools 189
Net preservatives 191

D.—APPARATUS ENTIRELY AUTOMATIC.

VI.—Traps.

20. Pen traps 193
Pocket traps 193
Labyrinth traps 193
Photographs and drawings illustrative of the trap fisheries 199
21. Spring traps 203
Animal traps 203
Spring hooks 203

E.—ACCESSORIES TO FISHING.

VII.—Decoys and Disguises.

22. Natural and artificial baits 205
23. Decoys 205
Sight decoys 205
Sound decoys 206

INTRODUCTORY NOTE.

The apparatus enumerated in this catalogue, including as it does many of the primitive forms employed by the North American Indians and Eskimo and the inhabitants of all portions of the country, for both fresh-water and sea-fishing, is exceedingly varied, and some of the forms are of peculiar interest. The list does not pretend, however, to include all of the American forms, or, indeed, all of those in the collections of the National Museum, but simply those that were sent to the London Fisheries Exhibition.

It frequently happens that the fishermen are obliged to partially cure their fish before landing them, in which case the apparatus employed in this work, as it is used by the fishermen themselves, is included with the apparatus of capture. The other implements used in preparation are excluded, and may be found in the catalogue of fishery products, prepared by Mr. A. Howard Clark, of the U. S. National Museum.

The apparatus employed in whaling being fully treated in the catalogue on "The Whale Fishery and its Appliances," prepared by Mr. James Temple Brown, who had charge of the collection and installation of the whaling exhibit, is also omitted.

In order to make the collection more intelligible to the English public, a large series of fishery photographs, representing all of the more important commercial fisheries in actual operation, were secured in uniform 8 by 10 inch negatives, by Mr. T. W. Smillie, the museum photographer, who visited the fishing districts for this purpose. The more important views were enlarged by means of the electric light to 30 by 40 inch photographs, many of them being retouched with crayon and India ink to render them more perfect in detail. This valuable collection was sent to London, and used both for purposes of decoration and illustration. These photographs, which number several hundred, are included with the apparatus which they are intended to illustrate.

An elaborate report on the history and development of American fishery apparatus is being prepared by Mr. G. Brown Goode and others, for publication in the reports of the United States Fish Commission; any detailed description of apparatus or history of the development of any particular form is, therefore, unnecessary in this place.

A.—APPARATUS OF DIRECT APPLICATION.

I.—HAND IMPLEMENTS.

1. Unarmed clubs.

CLUBS USED FOR KILLING SEALS AND SEA-ELEPHANTS.

SEALER'S CLUB.

A rough hickory stave, with knobbed handle and rope wrist-becket. Used by antarctic sealers and sea-elephant hunters. Length, 3 feet 3 inches. New Bedford, Mass., 1882. 54,533. Gift of Loum Snow & Son. Upon this club may be seen traces of blood from seals which its blows have killed.

SEALER'S CLUB.

A rough hickory stave. Used by the seal and sea-elephant hunters of Connecticut in the antarctic seal-grounds. Length, 4 feet. New London, Conn., 1880. 54,534. Gift of Lawrence & Co.

CLUBS USED FOR KILLING SALMON.

SALMON CLUB.

Made of cedar; end rudely carved in form of head of some animal. Length, 15 inches. Indians of Columbia River, 1860. 651. Collected by George Gibbs.

CLUBS USED FOR KILLING HALIBUT AND OTHER LARGE FISH BEFORE TAKING THEM INTO THE BOAT.

FISH CLUB.

Used for killing fish. Indian name "Tinethl." Length, 14½ inches. Makah Indians, Neah Bay. 72,660. James G. Swan. Every fisherman carries a club, and on hauling a fish to the surface invariably knocks it on the head to prevent it from jumping about in the canoe.

FISH CLUB.

Large end, natural formation of the root. Ornamentation on the end of handle was made by entwining the small limbs of a growing fir sapling into the form of a "Turk's head." In three or four years the sapling was cut, peeled, and finished. Length, 18 inches. Makah Indians, Neah Bay, W. T., 1883. 72,681. James G. Swan. Used by native fishermen to stun the fish by striking it on the head before the hook is removed from the mouth. Such clubs are usually nothing more than a billet of wood roughly fashioned, though sometimes rudely carved.

HALIBUT KILLER.

Made of hard wood, rudely carved. Used by Indians and Alieuts in the halibut fishery of Southern Alaska. Length, 20 inches. Southern Alaska, 1882. 67,828. Collected by John J. McLean.

HALIBUT-KILLER.

Made of oak. The head carved in the form of an eagle. Used by Indians and Aleuts in the halibut fishery of Southern Alaska. Length, 20 inches. Southern Alaska, 1882. 67,827. Collected by John J. McLean.

HALIBUT-KILLER, OR GOB-STICK.

Made by fishermen from the butt of an ash oar. The blunt end is used as a club; in the flat end is a notch for detaching hooks which have been swallowed. Near the blunt end is driven a peg, sometimes used to hold the line while extracting a swallowed hook. Length, 2 feet. Gloucester, Mass., 1879. 52,717. Gift of Capt. Philip Merchant, schooner Marion. This halibut-killer was in use for several months, and with it at least 1,000 halibut have been killed.

CLUB, OR GOB-STICK.

Lothrop's improved pattern. Made of white oak with brass gulleter. Used in the cod and halibut fisheries. Length, 2[illegible] inches. Gloucester, Mass., 1882. 54,532. U. S. Fish Commission. Unlike the old-fashioned halibut-killer, this implement has the club head and gulleter at the same end.

DRAWINGS ILLUSTRATING FISHERIES IN WHICH CLUBS ARE EMPLOYED.

SEA-ELEPHANT HUNTING.

An India-ink sketch of a portion of the shore of Herd's Island, covered with sea-elephants and men engaged in killing them with clubs and skinning them. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott, artist.

Flensing sea-elephants. An India-ink sketch of fishermen at Herd's Island engaged in skinning sea-elephants which they have killed with clubs, and preparing their skins for shipment. Size 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott, artist.

2. KNIVES.

ABORIGINAL KNIVES OF STONE AND METAL.

KELP KNIVES.

KELP-CUTTER. (Indian name "Che-bai-ak.")

Used by natives in procuring kelp for fishing-lines and other purposes. The kelp is gathered, while growing, at certain points

KELP-CUTTER—Continued.

only, and is found in its best condition for the uses of the natives during July and August. Length, 42½ inches. Port Townsend, W. T., 1883. 72,658. James G. Swan. Resembles in shape the capital letter **A**, the cross-piece forming the blade or knife for severing the kelp. A loop of cedar withe, for making fast a line, is fastened to each leg of the instrument. This apparatus is slipped over the bulb of the kelp and lowered to the bottom by means of a stone sinker, and a slight pull on the line severs the stem close to the ground.

SNOW-KNIVES.

SNOW-KNIFE.

Long blade, said to be made from a whaleman's boarding-knife, the original having been made from a navy cutlass; handle, walrus ivory. Length, 17½ inches. New Bedford, Mass., 1882. 68,125. U. S. Fish Commission. Obtained from one of the crew of whaling brig George and Mary. Made and used by Eskimo, Hudson Bay, for cutting out blocks of ice and snow in building igloos, as well as for cutting walrus meat, &c.

FISH KNIVES FOR GENERAL USE.

FISH-KNIFE.

Slate blade, with convex edge, set edgewise in wooden handle and secured by lashing of a strip of skin. Length, 3¾ inches. Big Lake, Alaska, 1879. 36,303. E. W. Nelson.

FISH-KNIVES (5).

Short slate blades, with convex edges, set edgewise in wooden handles. Length, 3¼ to 5⅜ inches. Bristol Bay, Alaska, 1882. 55,916. Charles L. McKay.

FISH-KNIVES, old (2).

Short slate blades, with convex edges, set edgewise in wooden handles. Length, 3¼ and 3⅞ inches. Bristol Bay, Alaska, 1882. 55,917. Charles L. McKay.

FISH-KNIFE.

Carefully finished; curved slate blade, pointed and having one edge, inserted in the end of a rudely-carved bone handle. Length, 6½ inches. Bristol Bay, Alaska, 1882. 56,025. Charles L. McKay.

FISH-KNIFE.

Blade, roughly chipped jasper, set edgewise in wooden handle. Length, 3¾ inches. Hotham Inlet, Alaska, 1880. 63,766. E. W. Nelson.

FISH-KNIFE.

Blade, roughly chipped jasper, set edgewise in wooden handle. Length, 3½ inches. Hotham Inlet, Alaska, 1880. 63,765. E. W. Nelson.

FISH-KNIVES (3).

Thin iron blades; two are set edgewise in ivory handles, the other is turned on itself in a scroll-shaped handle. Length, 3⅞ to 6¾ inches. Bristol Bay, Alaska, 1882. 55,918. Charles L. McKay.

FISH-KNIFE.

Thin iron blade, set edgewise in ivory handle. Length, 3¼ inches. St. Lawrence Island, Alaska, 1880. 63,277. E. W. Nelson.

SHEATH-KNIVES.

DAGGERS (4) AND SHEATHS (3).

Daggers consist of metal arrow-heads riveted into slots in short bone heads, in the other ends of which are inserted short plain wooden handles from 3½ to 7 inches long. Sheaths consist of two pieces of cedar hollowed out and lashed together. Lengths: daggers, 10 to 12 inches. 16,106, 16,107, 16,108, 16,110. Lengths: sheaths, 4½ to 5 inches; breadths, 1¼ to 2 inches. 16,104, 16,106, 16,110. Magemut Eskimos, Cape Etolin, Nunivak Island, Alaska, 1874. Collected by William H. Dall.

DAGGER.

Metal arrow-head riveted into a slot in a short bone head, in the other end of which is inserted a short, plain, wooden handle three-fourths of an inch in diameter. Nunivak Indians. Length, 11 inches; handle, 7 inches. Collected by William H. Dall.

SABER.

A common cavalry saber, obtained from a whaling-vessel. Length, 37 inches. New London, Conn., 1882. Gift of Lawrence & Co. 56,886. Used on board ship in the manufacture of boarding-knives, &c.

SAILORS' SHEATH-KNIVES.

Steel blades, thick and dull, with round point. Wooden handles. First and third qualities. Leather sheaths and belts. Centennial collection, 1876. 29,427–8. Gift of Wilcox, Crittenden & Co., Middletown, Conn. This style of blade is called "law abiding," and is the only style of sheath-knife allowed by law to sailors or fishermen.

HUNTERS' KNIVES.

Steel blades. Ivory, ebony, and hard-wood handles. Metal or solid guards. Blades, 5 to 7 inches long. Centennial collection, 1876. 26,143–168–225–6–8. Made by John Russell Cutlery Company, Turner's Falls, Mass. Carried by anglers and sportsmen.

MODERN FISH KNIVES.

BAIT KNIVES.

COD BAIT KNIFE.

Steel blade; single edge. Hard-wood handle. Length: blade, 8 inches; handle, 4½ inches. Gloucester, Mass., 1878. 32,665. U. S. Fish Commission. For cutting bait; carried in dories to remove refuse fish from trawls.

MACKEREL BAIT KNIFE.

Small size; steel blade, single edge. Pine handle. Length: blade, 3½ inches; handle, 3½ inches. Gloucester, Mass., 1878. 32,672. U. S. Fish Commission. Used in mackerel hook-fishery to cut bait in small pieces.

MACKEREL BAIT KNIFE.

Large size; steel blade, single edge. Pine handle. Length: blade, 4¼ inches; handle, 3¾ inches. Gloucester, Mass., 1878. 32,671. Gift of Alex. McCurdy, maker. Used in mackerel hook-fishery to cut bait in small pieces.

HALIBUT BAIT KNIFE OR CHOPPER.

Steel blade, single edge. Pine handle, bell-shaped. Length: blade, 13½ inches; handle, 5½ inches. Gloucester, Mass., 1880. 39,180. Gift of Alex. McCurdy, maker. Latest pattern of knife used on vessels to cut up fish for halibut bait.

HALIBUT BAIT KNIFE.

Steel blade, heavy and wide, razor-shaped, single edge. Hard-wood handle, riveted with metal pins, clinched and countersunk. Length: blade, 11½ inches; handle, 5 inches. Gloucester, Mass., 1878. 32,664. U. S. Fish Commission. Used on vessels to cut up fish for halibut bait.

HALIBUT BAIT KNIFE.

Steel blade, single edge. Pine handle. Length: blade, 11½ inches; handle, 6 inches. Gloucester, Mass., 1877. 29,406. Gift of Alex. McCurdy, maker. Used on vessels to cut up fish for halibut bait.

HALIBUT BAIT KNIFE.

Steel blade, heavy, curved, single edge. Hard-wood handle, hook-shaped. Length: blade, 14 inches; handle, 6¼ inches. New

HALIBUT BAIT KNIFE—Continued.

London, Conn., 1876. 26,201. Made by John Russell Cutlery Company. Used on New London fishing vessels to cut up small cod and other fish for halibut bait.

HALIBUT BAIT KNIFE.

Steel blade, heavy, curved, single edge. Beech-wood handle, hook-shaped. Length: blade, 12 inches; handle, $5\frac{3}{4}$ inches. New London, Conn., 1876. 26,196. Centennial collection. Used on New London fishing vessels to cut up small cod and other fish for halibut bait.

HALIBUT BAIT KNIFE.

Steel blade, wide and heavy, single edge. Hard-wood handle, straight. Length: blade, 12 inches; handle, 6 inches. New London, Conn., 1876. 26,159. Made by John Russell Cutlery Company. Used on New London fishing vessels to cut up small cod or other fish for halibut bait.

MINCING-KNIFE.

An old mincing-knife which has seen many years of service, showing the manner in which the width of blade has been reduced by frequent applications to the grindstone. Length, 36 inches. New Bedford, Mass., 1882. 56,849. Gift of Thomas Knowles & Co.

SPLITTING AND RIPPING KNIVES.

COD SPLITTING KNIFE.

Steel blade, with curved edge. Pine handle. Length: blade, $5\frac{3}{4}$ inches; handle, $4\frac{1}{2}$ inches. Gloucester, Mass., 1878. 32,687. U. S. Fish Commission. For splitting fish and removing back bone.

COD SPLITTING KNIFE.

Steel blade, with straight edge. Pine handle. Length: blade, $6\frac{1}{2}$ inches; handle, $4\frac{3}{4}$ inches. Gloucester, Mass., 1878. 32,668. U. S. Fish Commission. For splitting fish and removing back-bone.

MACKEREL SPLITTING KNIFE.

Steel blade, single edge, round end. Factory made handle. Length: blade, $3\frac{5}{8}$ inches; handle, $3\frac{1}{2}$ inches. Gloucester, Mass., 1878. 32,673. U. S. Fish Commission. Used to split mackerel for salting.

MACKEREL SPLITTING KNIFE.

Steel blade, single edge. Pine handle, stained, pewter mounted. Length: blade, $3\frac{1}{2}$ inches; handle, $4\frac{1}{4}$ inches. Gloucester, Mass.,

MACKEREL SPLITTING KNIFE—Continued.

1877. 29,408. Gift of Samuel Elwell, jr. Used to split mackerel for salting.

MACKEREL SPLITTING KNIFE.

Steel blade, single edge, round end. Home-made handle, pewter mounted. Length: blade, $3\frac{1}{8}$ inches; handle, $3\frac{5}{8}$ inches. Gloucester, Mass., 1877. 29,402. Gift of Alex. McCurdy, maker. Used to split mackerel for salting.

FISH SPLITTING KNIFE. (Indian name "Ko-che-tin.")

Used for splitting various kinds of fish, and for cutting halibut into thin flakes to facilitate drying. Length, 6 inches. Makah Indians, Neah Bay, W. T., 1883. 72,661. James G. Swan. The Makahs prefer this form of knife to any other for flaking halibut, as it is well adapted to the work. The women use it with great dexterity.

HADDOCK RIPPING KNIFE.

Steel blade, single edge. Whitewood handle. Length: blade, $4\frac{1}{4}$ inches; handle, 5 inches. Gloucester, Mass., 1877. 29415. Gift of Alex. McCurdy, maker. For ripping the fish from throat to vent in dressing cod-fish.

FLITCHING KNIVES.

HALIBUT FLITCHING KNIFE.

Steel blade, straight back, single edge. Pine handle. Length: blade, $9\frac{3}{4}$ inches; handle, $5\frac{1}{2}$ inches. Gloucester, Mass., 1877. 32,690. Gift of Adolph Voss, maker. Used on fishing vessels to cut off flitches or strips of halibut for salting and smoking.

HALIBUT FLITCHING KNIFE.

Steel blade, straight back, single edge. Pine handle, pewter mounted. Length: blade, $8\frac{1}{2}$ inches; handle, $5\frac{3}{4}$ inches. Gloucester, Mass., 1877. 29,412. Alex. McCurdy, maker. Used on fishing vessels to cut off flitches or strips of halibut for smoking.

HALIBUT FLITCHING KNIFE.

Steel blade, long and slender, single edge. Pine handle, pewter mounted. Length: blade, 13 inches; handle 6 inches. Gloucester, Mass., 1877. 29,400. Alex. McCurdy, maker. Used by shores-men to cut off flitches or strips of halibut for smoking and fins for pickling.

SLIVERING KNIVES.

MENHADEN SLIVERING KNIFE.

Steel blade, long and slender, single edge. Rough pine handle. Length: blade, 10½ inches; handle, 4½ inches. Gloucester, Mass., 1878. 32,666. U. S. Fish Commission. Used to cut off the fleshy parts or slivers of menhaden to be salted for cod, haddock, or mackerel bait.

MENHADEN SLIVERING KNIFE.

Steel blade, long and slender, straight back, single edge with one side beveled. Pine handle. Length: blade, 8½ inches; handle, 6 inches. Beverly Mass., 1877. 29,407. Gift of G. P. Foster. This was the earliest style of knife used by Cape Ann fishermen to prepare slivers of menhaden for cod, haddock, or mackerel bait.

MENHADEN SLIVERING KNIFE.

Steel blade, same width from hilt to point, straight back, single edge. Pine handle, short and thick. Length: blade, 9¼ inches; handle, 4¾ inches. Nantucket, Mass., 1877. 29,405. Gift of Samuel Elwell, jr. This is the pattern of knife used at Nantucket to prepare slivers of menhaden for cod, haddock, or mackerel bait.

MENHADEN SLIVERING KNIFE.

Steel blade, long and slender, single edge. Pine handle. Length: blade, 8½ inches; handle, 5¾ inches. Gloucester, Mass., 1877. 29,399. Alex. McCurdy, maker. Used to cut off the fleshy parts or slivers of menhaden to be salted for cod, haddock, or mackerel bait.

MENHADEN SLIVERING KNIFE.

Steel blade, long and narrow, single edge. Pine handle. Length: blade, 8½ inches; handle, 5¼ inches. Gloucester, Mass., 1876. 25,764. Gift of Samuel Elwell, jr. Used to cut off the fleshy parts or slivers of menhaden to be salted for cod, haddock, or mackerel bait.

HALIBUT-BAIT SLIVERING KNIFE.

Steel blade, single edge. Hard-wood handle. Length: blade, 12 inches; handle, 5 inches. Centennial collection, 1876. 26,144. Made by John Russell Cutlery Company, Turner's Falls, Mass. Used in Gloucester fisheries to slice off or "sliver" the fleshy parts of haddock and other fish for halibut bait. Sometimes used to flitch halibut.

HEADING KNIVES.

HALIBUT HEADING KNIFE.

Steel blade, single edge. Pine handle. Length: blade, 17½ inches; handle, 6 inches. Gloucester, Mass., 1878. 57,590. Gift of Adolph Voss, maker. Used for cutting off halibut heads.

THROATING KNIVES.

COD THROATING KNIVE.

Steel blade, single edge. Pine handle. Length: blade, 5¾ inches; handle, 6 inches. Beverly, Mass., 1877. 29,413. Gift of G. P. Foster. Knife used in early part of this century by Grand Bankers for cutting off heads and ripping bellies in dressing codfish.

COD THROATING KNIFE.

Steel blade, double edge. Pine handle, lead mounted. Length: blade, 6¾ inches; handle, 3¾ inches. Alaska pattern, 1880. 57,560. Gift of Alex. McCurdy, maker. Made at Gloucester, Mass., for use in Alaska in cutting off heads and ripping bellies in dressing codfish.

COD THROATING KNIFE.

Steel blade, double edge. Pine handle. Length: blade, 6 inches; handle, 4¼ inches. Gloucester, Mass., 1878. 32,670. U. S. Fish Commission. For cutting off heads and ripping bellies in dressing codfish.

COD THROATING KNIFE.

Steel blade, single edge. White-pine handle. Length: blade, 6 inches; handle, 4¼ inches. Gloucester, Mass., 1878. 32,669. U. S. Fish Commission. For cutting off heads and ripping bellies in dressing codfish.

COD THROATING KNIFE.

Steel blade, single edge. Pine handle, stained. Length: blade, 7 inches; handle, 5 inches. Gloucester, Mass., 1877. 29,411. Gift of Capt. E. L. Rowe. For cutting off heads and ripping bellies in dressing codfish.

COD THROATING KNIFE.

Steel blade, double edge. Pine handle. Length: blade, 5¼ inches; handle, 5½ inches. Beverly, Mass., 1877. 29,403. Gift of G. P. Foster. Used for cutting off heads and ripping bellies in dressing cod fish.

CHEEKING KNIVES.

COD CHEEKING KNIFE.

Steel blade, single edge, curved. Pine handle. Length: blade, 4¼ inches; handle, 4½ inches. Gloucester, Mass., 1877. 29,438. Gift of Alex. McCurdy, maker. For cutting cheeks from cod heads. Cheeks are salted and dried for food.

WHALEMEN'S KNIVES.

(See list of apparatus employed in the whale fishery.)

SKINNING KNIVES.

SEAL LEANING KNIFE.

Steel blade, long, curved. Hard-wood handle. Length: blade, 12 inches; handle, 5½ inches, New London, Conn., 1882. 57,691. Gift of Lawrence & Co. Used by the Antarctic sea-elephant hunters to "lean" or remove flesh from the blubber.

SEAL FLAYING KNIFE.

Steel blade, curved, single edge. Hard-wood handle. Length: blade, 6 inches; handle, 4½ inches. New London, Conn., 1880. 57,690. Gift of Lawrence & Co. Used by Antarctic fur-seal hunters.

SEAL FLAYING KNIVES.

Steel blades, curved, single edge, 5 to 7 inches long. Hard-wood handles. Centennial collection, 1876. 26,211–26,213, 26,169–26,171,26,179–26,181, 26,185–26,190. Made by John Russell Cutlery Company, Turner's Falls, Mass. Used by the seal and sea-elephant hunters of Connecticut in the Antarctic seal fisheries.

SKINNING KNIFE.

Slate blade, bowie-knife pattern, in end of wooden handle, served with strip of bark of cedar root. Length, 11 inches. Cape Vancouver, Alaska, 1880. 43,482. E. W. Nelson.

SKINNING KNIFE.

Arrow-shaped, slate-blade, sharp on both edges, set in the end of a wooden handle. Dug up on the site of an old village. Length, 7 inches. Saint Michael's, Norton Sound, Alaska. 43,431. E. W. Nelson.

KNIFE, STEEL, AND SHEATH.

Case containing knife and steel. Sheath made at sea; wood, two pieces bound with brass hoops; leathern guard or strap for attaching case to waist-belt; stamped with ornamental design

KNIFE, STEEL, AND SHEATH—Continued.

and initials (E. T.) of owner. Ordinary steel, handle "run in" with lead. Knife, bone handle, checkered; blade worn by sharpening. Length of case 10 inches, of knife 12 inches, of steel 14 inches. New Bedford, Mass., 1882. Gift of L. & W. R. Wing. 56,881. Used by the "skinners" (men whose duty it is to skin or flay seals) in the seal and sea-elephant fishery, at Herd's Island, Patagonia, South Georges, South Shetland, Desolation Island, &c.

PLOWS FOR CUTTING THE FLESH ALONG THE BACKBONE OF MACKEREL TO GIVE THEM A THICKER, FATTER APPEARANCE.

MACKEREL PLOW.

Steel blade; hickory handle. Length, 8 inches. Gloucester, Mass., 1882. 54,686. Gift of Capt. George Merchant. This plow was used for many years by Captain Merchant.

MACKEREL PLOW.

Ivory blade; hickory handle. Length, 7 inches. Gloucester, Mass., 1882. 54,684. Gift of Capt. Charles Parsons. This plow was used for many years by Captain Parsons.

MACKEREL PLOW.

Pewter blade; ash handle, carved and profusely ornamented; marked J. Blatchford. Length, $8\frac{3}{4}$ inches. Centennial collection, 1876. 25,775. Gift of Mrs. Hannah M. Burt.

MACKEREL PLOW.

Steel blade; ash handle, pewter mounted. Length, $7\frac{1}{2}$ inches. Centennial collection, 1876. 25,774. Gift of Edward Davis.

MACKEREL PLOW.

Copper blade; hickory handle, pewter mounted. Length, $6\frac{1}{2}$ inches. Centennial collection, 1876. 25,773. Gift of Edward Davis.

MACKEREL PLOW.

Silver blade, made of three-cent coin; walnut handle, cut in imitation of a human leg. Length, $7\frac{1}{2}$ inches. Centennial collection, 1876. 25,772. Gift of Sanford Freeman.

MACKEREL PLOW.

Steel blade, semicircular edge; cedar handle, pewter mounted. Length, $6\frac{3}{4}$ inches. Gloucester, Mass., 1876. 25,771. Gift of Samuel Elwell, jr.

MACKEREL PLOW.

Steel blade; plain ash handle. Length, 7 inches. Gloucester, Mass., 1876. 25,770. Gift of Samuel Elwell, jr.

MACKEREL PLOW.

Steel blade, semicircular edge; plain cedar handle. Length, 7½ inches. Gloucester, Mass., 1876. 25,769. Gift of Samuel Elwell, jr.

MACKEREL PLOW.

Steel blade; oak handle, profusely ornamented with pewter; marked "E. B." Length, 7¾ inches. Centennial collection, 1876. 25,768. Gift of Edwin Blatchford.

MACKEREL PLOW.

Factory made. Steel blade; walnut handle, with brass shaft. Length, 7½ inches. Provincetown, Mass., 1876. 25,720. Gift of Central Wharf Company.

MACKEREL PLOW.

Steel blade, three-cornered; ash handle. Length, 7⅞ inches. Harwichport, Mass., 1875. 25,674. Gift of Sanford Freeman.

SCRAPERS AND INSHAVES.

SCRAPER.

Roughly made handle, wood; half-ovate blade, with spur for insertion in handle; metal ferrule. Length, 8¼ inches. New Bedford, Mass., 1882. 57,074. Gift of Jonathan Bourne. May be used as a bone-scraper or inshave.

BONE-SCRAPER.

Handle of wood; blade of common hoop-iron, riveted to handle; roughly made. Length, 8½ inches. New London, Conn., 1882. 57,072. Gift of Lawrence & Co.

BONE-SCRAPER.

Handle of rough wood; shank and iron ovate frame forming the blade, common hoop-iron, slotted in handle; blade riveted to shank. A very old specimen. Length, 11½ inches. New Bedford, Mass., 1882. 57,076. Gift of Thomas Knowles & Co.

COOPER'S INSHAVE.

Handle, wood; frame, acute-ovate, with forward cutting-edge, riveted to handle. Length, 7 inches. New Bedford, Mass., 1882. 57,075. Gift of Thomas Knowles & Co. An old inshave, used for many years on a whaling vessel.

COOPER'S INSHAVE.

Wooden handle; blade of steel, with spur for fastening to handle; no ferrule; old. Length, 6¼ inches. New London, Conn., 1882. 57,073. Gift of C. A. Williams & Co.

COOPER'S LARGE INSHAVE.

Socket and shank of iron; ovate frame, with sharp cutting edge forward. Length, 19¼ inches. New London, Conn., 1882. 57,071. Gift of C. A. Williams & Co.

COOPER'S LARGE INSHAVE.

Handle, turned wood; iron frame, with cutting edge, and rear extension for attaching to handle. Length, 12¼ inches. New London, Conn., 1882. 57,070. Gift of C. A. Williams & Co. Used by the cooper of a whale vessel for smoothing the interior surfaces of wooden utensils.

COOPER'S SMALL INSHAVE.

Handle, wood; frame of iron, oblong-ovate; cutting edge on forward part; spur in rear for attaching to handle; metal ferrule. Length, 10 inches. New Bedford, Mass., 1882. 57,069. Gift of John McCullough.

COOPER'S INSHAVE.

Handle, turned wood; frame, iron; a true oblong-ovate, with blade on forward edge and spur for insertion in handle; metal ferrule. Length, 11½ inches. New Bedford, Mass., 1882. 57,067. Gift of Jonathan Bourne. An implement used by the cooper of a whale-ship for smoothing the interior of small utensils, such as boat-kegs, lantern-kegs, &c.

NET-MENDER'S KNIVES.

NET-MENDING KNIVES.

No handle; steel blade, round point, heel curled to fit middle finger like a ring. One for right and one for left hand. Gloucester, Mass., 1877. 29,439 and 29,440. Gift of Alex. McCurdy, maker.

3. AXES AND CUTTING SPADES.

AXES PROPER.

(See list of apparatus employed in the whale fishery.)

SPADES.

CUTTING SPADES AND WHALEMEN'S SPADES.

(See list of apparatus employed in the whale fishery.)

SPADES USED FOR DIGGING CLAMS AND OTHER INVERTEBRATES.

ROOT AND CLAM DIGGER.

Used by women. Indian name, "Kla-pai-uk." Length, 39½ inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,677. James G. Swan.

PHOTOGRAPHIC ILLUSTRATIONS OF FISHERIES IN WHICH SPADES ARE EMPLOYED.

CLAM-DIGGING.

Photographs of clam-boats stranded upon the beach, with clam-diggers engaged in unloading cargoes and carrying them to the clam-shanties, where they are shucked and sold for bait or sold fresh to peddlers, who carry them through the country. Size, 8 by 10 inches. Essex, Mass., 1882. (309) 1,961. U. S. Fish Commission.

CLAM-DIGGING.

A nearer photographic view of 1,961 (309), showing the men unloading clam-boats, and boys engaged in shelling, and peddlers' carts waiting to be loaded. Size, 8 by 10 inches. Essex, Mass., 1882. (310) 1,962. U. S. Fish Commission.

CLAM-DIGGING.

Photograph of clam-boats stranded upon the beach, with clam-diggers engaged in unloading cargoes and carrying them to the clam-shanties, where they are shucked and sold for bait, or sold fresh to peddlers, who carry them through the country. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Essex, Mass., 1882. (309) 1,961. U. S. Fish Commission.

CLAM-DIGGING.

A nearer photographic view of 1,961 (309), showing the men unloading clam-boats, and boys engaged in shelling, and peddlers' carts waiting to be loaded. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Essex, Mass., 1882. (310) 1,962. U. S. Fish Commission.

CLAM AND BAIT CHOPPERS.

CLAM-CHOPPER (old style).

Two iron blades, parallel to each other and joined at the top to a shank which is driven into a wooden handle. Length of blades, 8 inches; width, 1½ inches; length of handle, 2⅓ feet; diameter, 1½ inches. Rockport, Mass., 1840. 54,418. Gift of W. B. Parsons. Used for chopping up clams for mackerel bait

CLAM-CHOPPER.

Iron; a circular steel-edged blade with straight blade crossing at right angles, these being joined to iron handle, which has an eye or loop at top. Diameter of circular blade, 5 inches; length of chopper (including blades), $2\frac{3}{4}$ feet. Provincetown, Mass., 1877. 29,489. Gift of William H. Hesbolt. Used to chop clams for mackerel bait.

CLAM-CHOPPER.

Iron; three parallel steel-edged blades joined to iron handle, which has knob at top. Length of blades, $5\frac{1}{2}$ inches; width, $2\frac{1}{4}$ inches; length of handle, $3\frac{1}{3}$ feet. Gloucester, Mass., 1878. 32,676. Gift of Adolph Voss. Used to chop clam-bait for mackerel.

BAIT-CHOPPER.

Specimen of an old-style bait-chopper used by New England fishermen. Exhibited by William B. Parsons, Rockport, Mass.

BAIT-MILL.

Used in cutting bait in menhaden fishery. Little used at present, owing to the introduction of the purse-seine. Manufactured and exhibited by Adolph Voss, Gloucester, Mass.

4. THRUSTING SPEARS AND PRODS.

LANCES.

WHALING LANCES.

(See list of apparatus used in the whale fishery.)

LANCES USED IN KILLING SEALS.

SEAL-LANCE.

Pole, wood; lance-head, flint, lashed to pole and served with seal sinew; grip, ivory. Length, 10 feet 2 inches. Norton Sound, Alaska. Collected by E. W. Nelson.

SEAL-LANCE.

Long, heavy, semi-cylindrical blade of walrus ivory, secured in heavy cedar handle by a serving of stout sinew; butt of heavy ivory, secured in similar manner. Length, 49 inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,833. Lieut. P. H. Ray, U. S. A.

SEAL-LANCE.

A stout wooden handle with walrus-ivory lance, hollowed on one side, and an ivory butt-piece; the lance is lashed to the handle with a seizing of gut, and further secured by a string from the inner side of tip; an ivory peg is fastened to the butt of

SEAL-LANCE—Continued.

the point or blade, by means of which the operator is assisted in steadying the lance when manipulating it. Length, 5 feet. Bristol Bay, Alaska, 1882. 72,401. Collected by Charles L. McKay.

SEAL-LANCE.

A kind of lance which may be used for killing seal, sea-elephant, or walrus. Socket with extended sleeve. Section of pole attached. Length, 24 inches. New London, Conn., 1882. 56,369. Gift of Lawrence & Co. Old; has been used. Obtained from a New London sealer.

SEAL-LANCE.

A kind of lance which may be used for killing seal, sea-elephant, or walrus. Spoon-shaped head and extended sleeve or socket. Used by New Bedford sealers. Length, 24 inches. New Bedford, Mass., 1883. 56,368. Gift of Luom Snow & Son. Old. Obtained from a New Bedford sealing vessel.

SEAL-LANCE.

A kind of lance with a short shank, which may be used in killing seal, sea-elephant, or walrus. Socket with an extended sleeve. Length, 28½ inches. New Bedford, Mass., 1883. 56,367. Gift of Luom Snow & Son. Old; has been used.

SEAL-LANCE.

Long head; diamond point; common shank and socket. Manufactured by James Barton for the New London sealers. New. Length, 32½ inches. New Bedford, Mass., 1882. 56,366. U. S. Fish Commission.

SEAL-LANCE.

Pole, wood; lance-head, flint, lashed to pole and seized with seal sinew. Length, 9 feet. Cape Nome, Alaska. 45,419. Collected by E. W. Nelson.

SEAL-LANCE.

Pole, wood, served at tip with strips of baleen; shank, ivory, seized with thong of seal-skin; lance-head, iron, riveted to shank. Length, 12 feet 2 inches. Poonook, Alaska. 15,954. Collected by H. W. Elliott. Used by natives for the capture of seal or walrus.

SEAL LANCE AND HARPOON.

Handle, wood; lance, walrus ivory, lashed to butt with seal-skin; butt and tip of pole served with strips of wood; head-piece, walrus ivory, recessed for harpoon shank and lashed to pole

SEAL-LANCE AND HARPOON—Continued.

with a thong of seal-skin; grip, ivory. Harpoon wanting. Length, 12 feet. Cape Lisburne, Arctic Ocean. 46,176. W. H. Dall. Lance and harpoon combined; used by Eskimo.

ESKIMO SEAL-LANCE.

Pole, wood; butt, ivory, with wedge-shaped scarf for lance or spear; lance lashed to butt with seal-skin thong; finger-grip, ivory; tip of pole served with black and horn-colored baleen strips; head-piece and shank, walrus ivory; harpoon wanting. Length, 9 feet. Sledge Island. 45,416. Collected by E. W. Nelson. Harpoon and lance or spear combined.

ESKIMO LANCE.

Handle, wood, $\frac{1}{2}$ inches in diameter; butt-piece, ivory, wedge-shaped, inserted in scarf in the butt of pole and lashed and served with the sinew of the seal; ivory peg near tip of handle used as a finger-grip when manipulating the instrument; lance-blade, longitudinal section of walrus-tusk lashed to pole with seal thong. Total length, 8 feet. Alaska. 36,063. Collected by E. W. Nelson. Used by natives in the capture of seal and walrus.

ESKIMO LANCE.

Pole, wood; butt-piece seized to pole with seal sinew; grip, ivory; lance-blade, section of walrus tusk, 20 inches long, seized to pole and served with seal sinew. Length, 8 feet 3 inches. Alaska. 36,062. Collected by E. W. Nelson. Made and used by natives to kill both seal and walrus.

ESKIMO LANCE.

Pole, wood; butt-piece, ivory, wedge-shaped, inserted in scarf at butt of pole and served with seal sinew; grip, ivory; lance, walrus ivory, $18\frac{3}{4}$ inches long, lashed to pole and served with seal sinew. Length, 7 feet 6 inches. Nunivak Island, Alaska. 43,379. Collected by E. W. Nelson. Used by natives to kill seal and walrus.

ESKIMO LANCE.

Pole, wood; butt-piece seized to pole with seal sinew; grip, ivory; lance-blade, section of walrus tusk, 19 inches long, seized to pole and served with seal sinew. Length, 8 feet 3 inches. Nunivak Island, Alaska. 48,380. Collected by E. W. Nelson. Made and used by natives to kill both seal and walrus.

ESKIMO LANCE.

Pole, wood; butt-piece, ivory, served with seal sinew; rigid ivory grip; lance piece of walrus tusk, seized to pole with seal sinew.

ESKIMO LANCE—Continued.

Length, 7 feet 8 inches. Nunivak Island, Alaska. 48,378. Collected by E. W. Nelson. Manufactured and used by natives to kill both seal and walrus.

ESKIMO LANCE.

Pole, wood; butt-piece, ivory, wedge-shaped, seized and served with seal sinew; grip, ivory, lashed to pole with seal sinew; tip of pole served with seal sinew, recessed for lance; lance, bone, 22 inches long, lashed to pole with thongs of seal-skin. Length, 8 feet. Nunivak Island, Alaska. 48,377. Collected by E. W. Nelson. Used by natives to kill both seal and walrus.

WALRUS AND SEA-ELEPHANT LANCES.

WALRUS-LANCE.

Pole, wood; lance-head, flint, 4⅛ by 5 inches, inserted in recessed tip, lashed and served with seal-sinew; pole in two sections, to fit case. Total length, 20 feet 4 inches. Ooglaamie, Point Barrow, Alaska, 1882. 56,765. Collected by Lieut. P. H. Ray, U. S. A.

SEA-ELEPHANT LANCE.

Iron lance, 35 inches long, fitted to pole 6 feet long. New London, Conn., 1882. 57,077. Captain H. C. Chester. Used by Antarctic sea-elephant hunters.

PRODDING INSTRUMENTS.

SNOW-PROBES.

SNOW-PROBE.

A slender rod of bone, with a large knob and a small ferrule, apparently made of moose-horn; ferrule fastened with a small ivory peg. Length, 33 inches. Northeast coast of America. 10,274. Collected by Capt. C. F. Hall. Used by Eskimo in probing the air-holes in ice and under the snow to detect the presence of seals.

FISH-PRICKERS.

(Used for releasing the air from the bladders of fish before putting them in the vessel's well.)

FISH-PRICKERS.

Brass tubes set in wooden handles. Pensacola, Fla., 1881. 54,549 and 54,550. Collected by Silas Stearns. Used by fishermen of Gulf of Mexico to release wind from "poke-blown" red-snappers.

FISH-PRICKER.

A common awl, used by New York market-men to release the wind from the bladders of fish bloated after being caught at considerable depths. U. S. Fish Commission. 57,050.

II.—IMPLEMENTS FOR SEIZURE OF OBJECTS.

5. Scoops.

SHOVELS.

OYSTER-SHOVELS.

Model of shovel used in handling oysters on board vessels and boats in the Chesapeake oyster fishery. Baltimore, Md., 1880. 26,717. T. B. Ferguson.

DIP-NETS.

DIP-NETS USED FOR CATCHING FISH.

HAND-NET.

A dip-net made of woven sinews, with wooden frame; oval shape. Cape Navarin, Alaska. 38,728. Collected by E. W. Nelson. Used by natives of Alaska for taking sticklebacks.

FISHING BASKET.

Made in oval shape, of willow strips, by the Mohave Indians of Colorado River. Handle, 4 feet long, fastened across the center of the basket, which is 6 feet long, 25 inches wide, and 13 inches deep. Colorado River, Arizona. 24,148. Collected by Dr. E. Palmer. These baskets are pushed up-stream in front of the fishermen, who either wade or are paddled along in canoes.

DIP-NET.

Made by the McCloud River Indians, and used for fishing in small streams. Shasta County, California. 21,725. Collected by Livingstone Stone.

DIP-NET.

Made by the Indians and used in the capture of the oulachon or candle-fish (*Thaleichthys pacificus*) on the northwest coast of America. 658. Collected by G. Gibbs.

FISH-DIPPER.

Made of spruce roots, and fitted to short handle. Diameter of bowl, 8 inches; depth, 7 inches. Bristol Bay, Alaska. 55,936. Collected by C. L. McKay. Used by natives of Alaska in dipping up blackfish.

SMELT-NET.

Made of whalebone, with stone sinker. Diameter of hoop, 44 inches; depth of net, 24 inches. Plover Bay, Alaska. 49,178. Collected by E. W. Nelson.

SMELT-NET.

Made of the fiber of the common stinging nettle (*Urtica dioica*, L.). Stretched between two parallel sticks at the end of a curved handle; the inner stick plays on the handle to close net. Made by the Quilleute Indians, about thirty miles south of Cape Flattery. Handle, 53 inches long; sticks, 58½ inches; net, 53 by 15 inches at mouth, 30 inches deep; mesh, from ½ inch at point to 1½ at mouth. Washington Territory, 1883. 72,837. James G. Swan, Port Townsend, Wash. Used in taking a very choice species of smelt, *Hypomesus pretiosus*, called the surf-smelt, from its peculiar habit of depositing its spawn among the shingle of the beach, coming in with the surf in incredible numbers, and in this respect somewhat resembling the capelin, *Mallotus villosus*, of New Brunswick. On the first appearance of the fish the Indians rush into the surf and press the outer edge of the net down firmly on the sand or shingle, the swash of the breaker forcing the smelts into the net. Then, as the water recedes, they turn round quickly and hold the net so that the undertow will force more smelts into it. In this way, at times, at least a bushel are taken at a single scoop.

SMELT-NET.

Made of the fiber of the common stinging nettle (*Urtica dioica*, L.). Stretched between two parallel sticks at the end of a curved handle; the inner stick plays on the handle to close net. Made by the Quilleute Indians, about thirty miles south of Cape Flattery. Handle, 67 inches long; sticks, 64 inches; net, 58 by 15 inches at mouth, 30 inches deep; mesh, from ½ inch at point to 1½ at mouth. Washington Territory, 1883. 72,836. James G. Swan, Port Townsend, Wash. Used for the same purpose and in the same way as 72,837.

DRAWINGS ILLUSTRATIVE OF THE USE OF DIP-NETS.

SURF-FISHING WITH DIP-NETS.

In India-ink drawings, showing west coast Indians wading in the surf, and securing large quantities of small fish by means of dip-nets. Others are on the beach, employed in dressing the fish and stringing them upon lines to dry. Size, 30 by 40 inches. Coast of British Columbia, 1882. Henry W. Elliott.

DIP-NETS USED TO LIFT LISH FROM THE WATER AFTER THEY HAVE BEEN BROUGHT TO THE SURFACE BY MEANS OF THE HOOK AND LINE.

LANDING NET.

Rigged with short handle and used in trout-fishing. U. S. Fish Commission (C. B. & M.). 39,199.

LANDING NET.

Made with folding ring and bamboo-tip case handle. U. S. Fish Commission (C. B. & M.). 39,201.

LANDING NET.

Used in a boat for landing trout and other fish. U. S. Fish Commission (C. B. & M.). 39,200.

LANDING NET.

Made of blue silk, braided. U. S. Fish Commission (B. & A.). 25,639.

SALMON LANDING-NET FRAME.

Folding ring, nickel plated; handle in two parts. U. S. Fish Commission (C. B. & M.).

LANDING-NET STAFF.

Nason's patent net-staff, with flexible ring carried inside the staff. U. S. Fish Commission (B. & A.). 25,492.

LANDING-NET STAFF.

Nason's patent solid net-staff, with flexible ring. U. S. Fish Commission (B. & A.). 25,493.

DIP-NETS USED FOR CONVENIENCE IN HANDLING FISH.

MACKEREL DIP-NET.

An iron bow fitted with white cotton netting, and set in wooden handle 3 feet long. Gloucester, Mass., 1880. 39,483. Made by Alexander McCurdy. Used for scooping mackerel out of the seine and off the deck.

BOW OF SCOOP-NET.

Made of galvanized iron. A net is rigged to this bow and used in dipping fish from the well of a smack. Newport, R. I., 1875. 25,608. Gift of J. M. K. Southwick.

MENHADEN SHOVEL-NET FRAME.

Made of galvanized iron and set in shovel handle. Gloucester, Mass., 1878. 32,682. Made by Adolph Voss.

SCOOP-NET HOOP.

Series of different-sized hoops, made of galvanized iron, and used for crab-nets. Wilcox, Crittenden & Co. 25,165.

MACKEREL BOW-NET FRAME.

Made of galvanized iron and set in wooden handle about 3 feet long. Gloucester, Mass., 1878. 32,681. Made by Adolph Voss.

MACKEREL DIP-NET (exhibited with lay figure).

Consists of galvanized-iron hoop fastened to a long, stout, spruce-wood handle. A deep bag-net of tarred cotton is secured to the hoop, to which is also fastened a rope bridle with a thimble seized in the bight; into this thimble is bent a hoisting rope when the net is used. Diameter of hoop, 27 inches; length of handle, 10 feet; diameter of handle, 3 inches. Gloucester, Mass., 1883. 57,830. U. S. Fish Commission. Used for bailing mackerel from purse-seines or pockets to the deck of a schooner.

FISH-SCOOP.

Oval-shaped scoop made of wire, 20 inches long and 17 inches wide, fitted to wooden handle 46 inches long. U. S. Fish Commission. Used in Western States for handling whitefish.

DIP-NETS USED FOR REMOVING ICE FROM FISHING HOLES.

SMALL ICE-DIPPER.

Handle, wood, half-inch in diameter; dipper, bone, steamed and bent; circular bottom and flaring tip; bottom reticulate. Length, 21½ inches. Diomede Island, Alaska. 63,605. Collected by E. W. Nelson. Old. Used by natives for removing loose ice from seal-holes.

LARGE ICE-DIPPER.

Handle, wood, partially painted brick-dust red; dipper made of whalebone, steamed and bent into an almost circular shape (3⅜ inches by 3⅞ inches at bottom, 1 inch deep), with a lip; the bottom is interlaced with seal-skin thongs, forming a strainer; the dipper is lashed to the pole with seal sinew. New. Length, 38 inches. Alaska. 36,024. Collected by E. W. Nelson. Used by natives, when seal-hunting, for removing loose ice from seal-holes.

DREDGES.

SMOOTH DREDGES.

OYSTER-SCRAPE.

Galvanized-iron frame and net; no teeth. U. S. Fish Commission. 57,090. Used along Atlantic coast of the United States on oyster-beds in shoal water and soft bottom.

OYSTER-DREDGE.

Iron frame, 7 feet wide across mouth; lower side of net of iron mesh: upper side of white line; large wooden roller at bottom of net; no teeth. U. S. Fish Commission. 57,571. This style of dredge is used by the steam oyster-dredgers in Long Island Sound; usually two are carried, one being worked on each side of the vessel.

OYSTER-DREDGE AND HOISTING APPARATUS.

Model. Illustrating the method of hauling oyster-dredges in the Delaware and Chesapeake Bays. Received from C. S. Belbin, Baltimore, Md. 31,792.

SCALLOP-DREDGE.

Frame of iron; net, iron-mesh. Value, $4. 57,088. J. T. Brown. Style used at New Bedford, Mass., at present time.

SCALLOP-DREDGE.

Frame of iron; net, twine-mesh. Value, $3. 57,087. J..T. Brown. Style formerly used at New Bedford, Mass.; now obsolete.

SCALLOP DREDGE OR SCRAPE (usual style).

Triangular-shaped frame, consisting of two iron bails forming sides, their junction the apex, and an iron rim forming the base of the triangle; bails, 3 feet long, bent at 4 inches from ends at right angles to plane of frame and riveted to ends of rim; rim, 30 inches long, 1 inch wide; plane of rim at right angles to that of frame; bag, 2 feet deep; upper side of twine (2-inch mesh) attached to a small iron cross-bar across bails, 8 inches from ends; lower side of iron rings, 2 inches in diameter, six tiers, joined to edge of rim; across bottom of bag is lashed a small stick, 27 inches long, $\frac{3}{4}$ inch in diameter, for convenience in handling bag and shaking out contents. Value, $5. 56,935. U. S. Fish Commission. Used in Narragansett Bay, Rhode Island, on hard bottoms.

SCALLOP-DREDGE (kettle-bail variety).

Frame triangular in shape, consisting of two iron bails joined at apex of triangle and forming an eye for attaching dredging rope. The base of triangle is formed by the "rim," a flat, slightly curved piece of iron, 1 inch wide and 30 inches long. The rim and ends of bails are joined by means of eyes welded in each, so as to permit the rim to work loosely and assume any inclination to the plane of the bails which may be rendered necessary by the character of the bottom. Three inches from the ends, and before joining the rim, the bails are bent in a direction at right angles to the plane of the frame. A small iron cross-bar extends across the bails 8 inches from ends, to which is attached the upper part of the "bag," which is of twine-netting, 3-inch mesh. The bag is 2 feet deep; under side composed of six tiers of iron rings, 2 inches in diameter. At bottom of bag is lashed a small stick, $\frac{3}{4}$ inch in diameter and 27 inches long, for convenience in handling and shaking out contents. Value, $5. 56,934. U. S. Fish Commission. Used in Narragansett Bay, Rhode Island, on muddy bottoms.

SCALLOP-DREDGE (sliding variety).

Triangular-shaped frame, consisting of two iron "bails" forming sides, their junction the apex, and an iron "rim" forming the base of the triangle; bails, 3 feet long, bent at 3 inches from end at right angles to the plane of the frame and riveted to rim; rim, 30 inches long, 1 inch wide, set at an angle of about 30° with plane of frame; bag, 2 feet deep; upper side of twine (2-inch mesh) attached to a small iron cross-bar across bails, 8 inches from ends; lower side of iron rings, 2 inches in diameter, six tiers, joined to edge of rim; across bottom of bag is lashed a small stick, 27 inches long and $\frac{3}{4}$ inch in diameter, for convenience in handling bag and shaking out contents. Value, $5. 56,933. U. S. Fish Commission. Used in Narragansett Bay, Rhode Island, on grassy bottoms.

SCALLOP-DREDGE.

Old-style dredge, formerly used in the scallop-fisheries along the southern coast of New England. Exhibited by John A. Sawyer, New Bedford, Mass.

PHOTOGRAPHS ILLUSTRATING THE USE OF DREDGES.

OYSTER-DREDGING.

Photograph of a small steamer at work on the oyster banks off the coast of Southern New England. The steamer is towing two dredges, having a line fastened amidships on either side. A portion of the crew are just hauling a third dredge, loaded with oysters, over the gunwale. Size, 30 by 40 inches. New Haven, Conn., 1882. U. S. Fish Commission.

TOOTHED DREDGES AND RAKES.

OYSTER-RAKE OR TOOTHED DREDGE.

Galvanized-iron frame; 12 teeth; net of iron-mesh; lower braces fitted with iron sliders to protect side of vessel from teeth. U. S. Fish Commission. 57,089. Used along Atlantic coast of the United States in natural oyster-beds.

CLAM-RAKE.

Iron frame, consisting of head 28 inches wide, and four iron bows connecting teeth, head, and frame; teeth, 23 in number, $4\frac{1}{2}$ inches long; frame covered with twine-net; pole, 13 feet long, fits in socket at top of frame. U. S. Fish Commission. 57,695. Used at Nantucket, Mass., in taking "sea-clams" (*Mactra solidissima*).

CLAM-RAKE.

Four-foot handle, fitting in socket in head of rake. Rake of iron. J. T. Brown. 57,091. Style used at Provincetown, Mass.

CLAM-RAKE.

The rake is an iron frame, with 12 teeth, each 6 inches long; head, 17 inches wide; handle, 5 feet long, fits in iron socket. U. S. Fish Commission. 36,047. Used at Wellfleet, Mass.

CLAM-RAKE.

The rake consists of an iron head 15 inches long, with 13 teeth set at right angles to the plane of the head; the back of the rake is formed by three iron bars of the same length and parallel to the head, and extending at the extremities 2 inches to the front and joinging an upright iron piece welded to the exterior. A pole or handle 5 feet long fits in a socket on the upper bar. U. S. Fish Commission. 36,046. Used at Wellfleet, Mass.

CLAM-RAKE.

Iron frame, 28 inches wide. Head furnished with 16 teeth, each 6 inches long. Pole or handle, 23 feet long, fits in socket at top of frame. U. S. Fish Commission. 36,043. Used on the coast of New England in taking the "hard" or "round" clam (*Venus mercenaria*) and the "sea" clam (*Mactra solidissima*).

CLAM-RAKE.

Iron frame, 2 feet wide; head furnished with 16 teeth, each 6 inches long; pole or handle, 18 feet long, fits in socket on top of frame. U. S. Fish Commission. 36,040. Used on coast of New England in taking "hard" or "round" clams (*Venus mercenaria*) and "sea" clams (*Mactra solidissima*).

CLAM-RAKE.

Triangular shaped frame, consisting of two iron bails and iron rim; the bails forming the sides, their junction the apex, and the rim the base of the triangle. Rim flat, slightly curved to rear, 2 inches wide, and 33 inches long; bails riveted to ends; teeth, 17 in number, 10 inches long, riveted to upper side of rim and bent downward at right angles to plane of frame. Apex of triangle, 40 inches from rim, and formed in an eye for attaching rope. Bag of twine, 40 inches deep, 1-inch mesh; attached to the rim and to a light iron frame, bolted to rim and perpendicular to plane of frame. U. S. Fish Commission. 36,043 (*a*). Used at Nantucket and vicinity in taking the "sea" or "hen" clams (*Mactra solidissima*).

6. GRASPING IMPLEMENTS.

TONGS.

OYSTER-TONGS.

Wooden heads, 17 inches wide, fitted with eight small, iron teeth in each; frame consists of eight brass rods or bows joining

OYSTER-TONGS—Continued.

heads and shafts, and forming the receptacle for the oysters; head and frame in same plane with shaft; shafts of wood, 8 feet long, joined 27 inches from heads by a brass pin. Providence, R. I. 26,109. S. Salisbury. Used in Narragansett Bay and Long Island Sound.

OYSTER-TONGS.

Wooden heads, 2 feet wide, fitted with 12 small iron teeth in each; 11 brass rods extend from heads to shafts, forming the receptacle for the oysters; head and frame in same plane as shaft; each shaft is made of wood, and is 8 feet long; shafts joined 31 inches from heads by a brass pin. Providence, R. I. 26,110. S. Salisbury. Used in Narragansett Bay and Long Island Sound.

OYSTER-TONGS.

Iron head and frame, 20 inches wide; frame consists of 3 iron rods on each side, curved outward to increase capacity; 10 teeth in each head; shafts, 10 feet long, joined at 33 inches from head. U. S. Fish Commission. 57,693. Used along the whole coast.

OYSTER-TONGS.

Galvanized-iron head and frame, 20 inches wide. Frame consists of 5 iron bars on each side, curved outward to increase capacity; 10 teeth in each head; shafts of wood, joined at 30 inches from head. U. S. Fish Commission. 57,694. Used from Narragansett Bay to the Capes of Virginia.

OYSTER-TONGS.

Galvanized-iron frame and head, 20 inches wide; frame consists of two bars, slightly curved outward to increase capacity; 10 teeth in each head; shafts of wood, joined at 29 inches from head. Middletown, Conn. 25,205. Wilcox, Crittenden & Co. Used in Long Island Sound.

OYSTER-TONGS.

Small model of oyster-tongs used on the New Jersey coast. Exhibited by William P. Haywood, West Creek, N. J.

NIPPERS.

CATFISH-NIPPERS.

Philadelphia, Pa. Exhibit of A. B. Shipley & Sons.

7. HOOKED IMPLEMENTS.

(Those used with a single motion, that of hooking.)

SINGLE-POINTED HOOKS.

GAFF-HOOKS.

SALMON-HOOK.

Iron, single barb, lashed to wooden sockets by seizing of bark of cedar roots (?); rawhide ganging; socket fits on end of staff. Quilleute Indians, about 30 miles south of Cape Flattery. Length, 7½ inches; spread, 3 inches. Washington Territory, 1883. 72,838. James G. Swan, Port Townsend, Wash. Used in deep water. It is placed on the end of a long pole, which is held down to the bottom until a salmon is felt against it, when, with a quick pull, the fish is hooked and hauled on board.

GAFF-HOOK.

Round bend Kirby hook, the same kind as is used by our eastern coast halibut fishermen. Wooden socket for pole served with common white wrapping twine. Length, 7½ inches. Makah Indians, Cape Flattery, 1883. 72,653. James G. Swan. Used for the capture of salmon in streams. Common to the Indians of the Northwest coast.

GAFF-HOOK.

Round bend, barbless hook, with wooden socket for pole served with twine. The pole when inserted in the socket is held by a lanyard. Length, 12 inches. Makah Indians, Cape Flattery, 1883. 72,652. James G. Swan. Used for the capture of salmon in streams. The salmon are gaffed, knocked on the head with a club and secured. Common to the Indians of the Northwest coast.

GAFF-HOOK.

Round bend Kirby hook, the same kind as is used by our eastern coast halibut fishermen. Wooden socket for pole served with common white wrapping twine. Length, 5½ inches. Makah Indians, Cape Flattery, 1883. 72,654. James G. Swan. Used for the capture of salmon in streams. Common to the Indians of the Northwest coast.

SALMON-GAFF.

Nickel-plated hook, 8 inches long, with 2½ inches spread, fitted to oak handle 4 feet long. U. S. Fish Commission.

SALMON-GAFF.

Hook 7 inches long, with 2½ inches spread, fitted to wooden handle. Length, 46 inches. U. S. Fish Commission. 25,225.

SALMON-GAFF.

Hook 7 inches long, with 2½ inches spread, fitted to bamboo handle. Gaff detachable from handle. U. S. Fish Commission (C., B. & M.). 39,202.

TERRAPIN HUNTERS' GIG.

Iron hook driven into hard-wood handle; iron ferrule at lower end of handle. Length of handle, 3½ feet; hook, 4 inches; width of hook, 2¼ inches. Centennial collection, 1876. 25,930. U. S. Fish Commission. Used for hooking terrapins out of marshes.

MACKEREL-GAFF.

Long galvanized steel-wire shank with two recurved points, attached to hard-wood handle by seizing of tarred line. Length of steel shank, 3 feet 5 inches; handle, 6 feet; diameter of handle, 1 inch. Gloucester, Mass., 1877. 29,436*a*. U. S. Fish Commission. Formerly used to gaff mackerel as they swam alongside of the vessel.

MACKEREL-GAFF.

Double hook, with 2½-inch prongs, on shank of iron wire 2 feet 6 inches long. Wellfleet, Mass., 1877. 29,436. Gift of M. W. Grant. This gaff, attached to a six-foot pole, is used in catching mackerel when swimming in large schools.

DECK HALIBUT-GAFF.

Iron hook fastened to hard-wood shovel-handle. Length of hook, 7 inches; spread of point, 3 inches; length of handle, 19½ inches. Gloucester, Mass., 1878. 32,683. Collected by G. Brown Goode. Used for handling halibut on vessel's deck during process of cleaning, &c.

DECK HALIBUT-GAFF.

Galvanized-iron hook seized with tarred line to hard-wood handle. Length of handle, 6 feet; hook, 8 inches; breadth of hook, 2½ inches. Gloucester, Mass., 1878. 32,678. U. S. Fish Commission. Used by hand-line fishermen for gaffing halibut.

DECK COD-GAFF.

Galvanized-iron hook seized with tarred-cotton line to oak handle. Length of handle, 4 feet; hook, 4½ inches; breadth of hook, 2½ inches. Gloucester, Mass., 1876. 25,938. Gift of Alex. McCurdy. Used for gaffing fish from the deck of a schooner.

DECK HALIBUT-GAFF.

Iron hook with looped handle at top. Total length, 12 inches; spread of hook, 4 inches. Gloucester, Mass., 1876. 25,934.

DECK HALIBUT-GAFF—Continued.

Gift of Alexander McCurdy. Used for handling halibut on vessel's deck, in ice-houses, &c.

HALIBUT-GAFF.

Iron hook with looped handle at top of shank. Length, 14 inches; spread of hook, 3½ inches. Gloucester, Mass., 1877. 29,388. U. S. Fish Commission. Used for gaffing halibut in dories and for handling these fish generally.

DORY COD-GAFF.

Iron hook seized with tarred line to hard-wood handle. Length of handle, 3 feet; hook, 4 inches; spread of hook, 2 inches. Gloucester, Mass., 1876. 25,939. Gift of Alexander McCurdy. Used for gaffing fish which have broken loose from the hooks, or which are too heavy to be lifted into a dory by the gangings.

DORY HADDOCK-GAFF.

Steel hook seized to hard-wood handle, with tarred line. Length of hook, 6½ inches; width, 2 inches; handle, 3 feet long. Gloucester, Mass., 1876. 25,935. U. S. Fish Commission. Used by haddock fishermen to gaff fish which drop off the hook of the trawl or set line.

DORY HADDOCK GAFF. (Small size.)

Iron hook seized with tarred line to hard-wood handle. Length of handle, 3 feet; hook, 7½ inches; breadth of hook, 1½ inches. Gloucester, Mass., 1876. 25,225. U. S. Fish Commission. Used for gaffing haddock which fall off the hooks.

SEALER'S GAFF.

A small steel hook 4 inches long, 1 inch wide; seized with twine to flat oak handle 4 feet long. New London, Conn., 1883. 56,889. Collected by James Temple Brown. Used by Antarctic fur-seal hunters.

HALIBUT-HAWKER'S LONG-HANDLED GAFF.

Iron hook seized with tarred line to hard-wood handle. Length of handle, 4 feet; hook, 7 inches; width, 2½ inches. Gloucester, Mass., 1883. 57,832. U. S. Fish Commission. Used by halibut packers to haul fish about the floor of packing-houses.

HALIBUT-HAWKER'S HAND-GAFF.

Iron; looped handle, closed at right angle to shank. Length of gaff, 22 inches; spread of hook, 2½ inches; handle, 4½ inches long. Gloucester, Mass., 1883. 57,833. U. S. Fish Commission. Used by halibut buyers and packers in handling and boxing fish.

GAFFS USED IN DRESSING FISH.

HALIBUT HEADER'S HOOK.

Galvanized-iron S-shaped hook, fastened into wooden handle. This implement is similar to the common cotton-hook. Length of hook, 7½ inches; spread of point, 3 inches; length of handle, 4 inches. Gloucester, Mass., 1878. 32,691. U. S. Fish Commission. Used in fresh-fish establishments for holding up the heads of halibut while they are being cut off.

HALIBUT FLITCHER'S HOOK.

Made of iron, with eye and rope strap. Gloucester, Mass., 1882. 54,476. Gift of Captain Joseph Ryan. Used on halibut vessels at Greenland in preparing flitches for salting. The rope-strap loops on a peg in the table-edge when the hook holds the fish in place.

HALIBUT FLITCHER'S HOOK.

A double hook of iron, connected with a swivel. Gloucester, Mass., 1882. 54,412. Gift of A. M. Burnham. Used on halibut vessels in preparing flitches for salting. The smaller hook fits on the edge of the cutting-table, while the larger one hooks into the fish, holding it in place while being flitched.

FISH-SOUNDERS.

SOUNDER.

A small-pronged hook, with shank 13 inches long; piece of wood 8 inches long on the shank. Moorehead City, N. C. 54,505. Collected by R. E. Earll. Used to remove the bladders or sounds from fresh squeteague or spotted trout.

MANY-POINTED HOOKS.

FISH FORKS OR PEWS.

FISH-PEW.

A curved and pointed steel prong driven into an oak handle and secured by an iron ferrule. Length of prong, 6½ inches (outside); handle, 4 feet; ferrule, 4 inches. Gloucester, Mass., 1878. 32,716. Gift of Capt. S. J. Martin. Used for handling fish more especially cod, &c.

TWO-PRONGED PEW-GAFF.

This is a combination of the pew and the gaff, the ordinary fish-pew being supplemented by a short curved spur which is welded upon it close to its junction with the handle. Steel pew and hook fastened to hard-wood handle, which has iron ferrule on lower end. Length of handle, 4 feet; pew-tine, 5 inches;

TWO-PRONGED PEW-GAFF—Continued.

gaff-tine, 4 inches. Gloucester, Mass., 1880. 32,685. U. S. Fish Commission. Used for pitching or gaffing fish and for rolling barrels.

FISH-FORK.

A common two-tined pitchfork, steel tines, hard-wood handle. Length of tines, 8½ inches; handle, 4 feet; iron ferrule on handle, 4 inches long. Gloucester, Mass., 1878. 32,684. Gift of Adolph Voss. Used for handling fish.

FISH-FORK.

Three tines, steel, hard-wood handle, iron ferrule on lower end of handle. Length of tines, 7 inches; handle, 28½ inches; ferrule, 3½ inches. Gloucester, Mass., 1878. 32,730. U. S. Fish Commission. Used for handling fish, more especially the smaller species.

SQUID FORKS USED IN BAITING HOOKS WITH SQUID.

SQUID-FORK.

A two-pronged fork, set in a wooden handle. Gloucester, Mass., 1878. 32,727. U. S. Fish Commission. Used in handling squid for cod-bait.

MANY-POINTED FISH-JIGS.

MACKEREL-BOB.

Made of galvanized wire. Shank, 6½ inches long; two pieces crossing at right angles formed to foot of shank with four prongs 1½ inches long. Provincetown, Mass., 1877. 29,441. Gift of William H. Hesbolt. Used when mackerel, in large numbers, are baited up close to the vessel. Four fish are sometimes taken at a time with this bob.

OULACHON RAKES OR SPEARS.

OULACHON RAKE OR COMB.

A long wooden pole with series of teeth at one end. Made by Flathead Indians of Northwest coast. Port Townsend, Washington Territory. Collected by J. G. Swan. Used in the capture of the oulachon or candle-fish (*Thaleichthys pacificus*).

SQUID-JIGS.

SQUID-JIG.

Pattern of 1830. Made of 8 iron wire pins molded to lead sinker 5 inches long. Provincetown, Mass., 1877. 29,443. Gift of Lemuel Cook, 2d. Used to catch squid for cod bait.

SQUID-JIG.

Pattern of 1846. Made of brass pins seized with cotton twine; lead sinker 3½ inches long. Gloucester, Mass. 54,480. Gift of David W. Low. Used to catch squid for cod-bait.

SQUID-JIG.

Style of 1850. Made of 8 brass pins molded in lead sinker 3½ inches long. Gloucester, Mass. 39,177. Gift of Daniel McAskell. Used in catching squid for bait.

SQUID-JIG.

Made by fishermen on shipboard. Brass pins molded to lead sinker 2 inches long. Gloucester, Mass. 57,947. Gift of Captain George Merchant, jr. Used to catch squid for cod-bait.

SQUID LINE AND JIG.

White cotton line on wooden reel; blue cotton ganging; jig made of brass pins molded to lead sinker 3½ inches long. Gloucester, Mass. 54,414. U. S. Fish Commission. Used in hand-line dory cod-fishing on Grand Bank to catch squid for bait.

SQUID-JIG.

Made by fishermen on ship-board. Brass pins seized with tarred cotton twine to lead sinker 3½ inches long. Gloucester, Mass., 1880. 39,176. U. S. Fish Commission. Used to catch squid for cod-bait.

SQUID-JIG.

Made of brass pins molded to lead sinker 3¼ inches long, painted red. Gloucester, Mass., 1878. 32,722. Gift of Robert H. Hurlburt. Used to catch squid for cod-bait.

SQUID-JIG.

Made of brass pins molded to lead sinker 3 inches long. Gloucester, Mass., 1878. 32,721. Gift of Robert H. Hurlburt. Used in catching squid for cod-bait.

SQUID-JIG.

Made of brass pins molded to lead sinker 3 inches long, painted red. Gloucester, Mass., 1876. 25,776. Collected by A. R. Crittenden. Used to catch squid for cod-bait.

SQUID-JIG FORMER.

Made of soapstone in truncated form, with longitudinal grooves for shaping pins for squid-jigs. Rockport, Mass., 1877. 29,447. Gift of John B. Parsons.

8. Barbed implements.

(Those used with two motions, the first that of thrusting.)

SPEARS WITH FIXED HEADS.

SINGLE-POINTED SPEARS.

CONCH-HARPOON.

Made of iron, with single flue; socket for pole; rope-strap. Key West, Fla. 39,426. Gift of Dr. J. W. Velie. Used by Bahamians and fishermen of Key West in the capture of large fish.

CRAB AND FLOUNDER SPEARS.

Made of iron; used with pole. Newport, R. I., 1876. 25,594–5. Gift of J. M. K. Southwick.

PORPOISE-SPEAR.

Iron spear head and shank, 13 inches long; handle, 12 feet long. Eastport, Me., 1882. 54,337. U. S. Fish Commission. Used by Passamaquoddy Indians, near Eastport, Me., in porpoise hunting, for striking and holding the porpoise after it has been shot.

MANY-POINTED SPEARS.

Stationary prongs.

FISH-GRAINS.

Two prongs with barbed ends. Socket for handle. U. S. Fish Commission. 57,095.

NEPTUNE EEL-SPEAR.

Galvanized iron, three flat prongs, serrated edges; socket for handle. U. S. Fish Commission. 29,491.

DOLPHIN-GRAINS.

Three prongs, barbed; socket for handle. Length, with pole, 6 feet. U. S. Fish Commission. 25,931.

FISH-SPEARS.

Three and five prongs, barbed; spike-head for handles. U. S. Fish Commission (B. & A.). 25,556.

FISH-SPEARS.

Four prongs, barbed; socket for handle. U. S. Fish Commission. 25,556(*a*).

EEL-SPEAR.

Five prongs, two pointed, one flange end; socket for handle. U. S. Fish Commission (B. & A.). 25,557. Used for spearing eels in summer season.

FISH-SPEAR.

Five prongs, barbed; screw-head for handle. U. S. Fish Commission (C., B. & M.). 39,203.

FISH-SPEARS.

Five prongs, barbed. Sockets for handles. U. S. Fish Commission (C., B. & M.). 39,204–5.

EEL-SPEAR.

Six flat prongs, unbarbed; spike-head for handle. U. S. Fish Commission, 1876. 25,225. Used in southern New England.

EEL-SPEAR.

Seven prongs, three pointed, and four flange ends; screw-head for handle. U. S. Fish Commission (B. & A.). 25,557 (*a*). Used for spearing eels in summer season.

EEL-SPEAR.

Seven prongs; six with hook ends and one spear end. U. S. Fish Commission (C., B. & M.). 39,206.

EEL-SPEAR.

New Bedford pattern. Seven prongs: six with hook ends and one spear end. New Bedford, Mass., 1876. 25,647. Gift of H. S. Kirby.

EEL-SPEAR.

Seven prongs: six with hooked ends and one spear-shape; socket for handle. U. S. Fish Commission (B & A.). 25,559. Used for spearing eels in the winter season.

EEL-SPEAR.

Seven prongs: six hook ends and one spear end; socket for handle. U. S. Fish Commission (B. & A.). 25,557 (*b*). Used for summer fishing.

EEL-SPEAR.

Seven prongs; three hooked and one spear-shape; socket for handle. U. S. Fish Commission (B. & A.). 25,558. For winter fishing.

FROSTFISH SPEAR.

Eight prongs of bronzed wire; pine handle; full length of handle, 5 feet. New Bedford, Mass., 1882. 57,084. Gift of S. Eggers, jr. Used by fishermen of Southern New England in the capture of frostfish.

EEL-SPEAR.

Made of galvanized iron; eight hook-prongs and one spear-shape; socket for handle. Belfast, Me., 1877. 29,495. Gift of John Thombs. Pattern of eel-spear peculiar to Belfast and vicinity.

EEL-SPEAR.

Nine prongs, eight with hook ends and one speared; socket for handle. U. S. Fish Commission (B. & A.). 25,558 (*a*). For winter fishing.

EEL-SPEAR.

Eleven prongs, ten with hooked ends and one spear-shape; socket for handle. U. S. Fish Commission. 25,224. Southern New England pattern.

FROSTFISH SPEAR.

A row of twelve sail-needles set in flat piece of wood; pine handle, spliced in wedge-shaped form in head of ash. Full length of handle, 5 feet. New Bedford, Mass., 1882. 57,083. Gift of James Beetle. Used on Southern New England coast for the capture of frostfish.

Adjustable prongs.

FIVE-PRONGED GRAINS.

Adjustable; prongs of steel; socket for handle. Wilcox, Crittenden & Co. 54,324. Used same as spear in the capture of fish.

EEL-SPEARS.

Adjustable prongs, patent; seven prongs; six with hook ends, one spear-shape. U. S. Fish Commission. 57,096.

EEL-SPEARS.

Adjustable prongs; Hedges's patent; socket for handle; five and nine prongs. Made by S. P. Hedges. 26,072 to 26,074.

EEL-SPEAR.

Nine prongs, adjustable, patent; six prongs, with hook ends, one spear-shape. U. S. Fish Commission. 57,097.

ADJUSTABLE PRONGS.

Hook ends; for patent eel-spear. U. S. Fish Commission. 57,098.

ABORIGINAL FISH-SPEARS.

SALMON-SPEAR.

Pole, white pine; two bone prongs, with triangular barbs, fastened with wooden pegs and lashed with strips of baleen; central spear, bone, barbless. Length, 52 inches. Norton Sound, Alaska, 1876. 29,864. Collected by L. M. Turner. Used to capture salmon when ascending small rivers and creeks.

FISH-SPEAR.

Sharp-pointed, conical, horn tip, secured by a pin to the end of a rough wooden staff. Made by Clallam Indians. Length, 57 inches. Washington Territory, 1876. 23,519. James G. Swan.

FISH-SPEAR.

Pole, wood; two projecting prongs, with bone barbs seized with twine; central spear tipped with bone and lashed to pole with twine. Length, 62 inches. Northwest coast of United States. 23,518. Collected by James G. Swan.

POINTS FOR SALMON-SPEARS (2).

Made of split deer-bones, with wooden sockets to receive shaft; covered with pitch. Line of modern manufacture. Made by McCloud River Indians. Length, $3\frac{1}{2}$ and $4\frac{1}{4}$ inches. Shasta County, California, 1873. 13,743. Livingston Stone.

SALMON-SPEAR.

Pole, spruce; two wooden prongs, each with a triangular barb, and a central barbless iron spear lashed to the tip of handle. Length, 100 inches. Eastport, Me. 11,429. Passamaquoddy Indians. Dr. E. Palmer.

FISH-SPEARS (4).

With one, two, and three points, of ivory, bone, or iron. Length, $12\frac{3}{4}$ to $29\frac{1}{4}$ inches; spread, 2 to 5 inches. Northern and northwestern coasts of America. 10,283, 10,380, 18,933.

FISH-SPEAR.

Shaft of cedar, $\frac{1}{2}$ inch in diameter, painted red, and end enlarged into a head, in which is inserted and lashed a flat carved and barbed bone 1 foot 2 inches in length. In a slot in outer end of latter is lashed a metal spear-head. Used in fishing by Alaskan Indians, Sitka. Length, 4 feet 9 inches; bone head, 1 foot 2 inches. Alaska, 1867. 5,776. Collected by Captain Howard, U. S. Revenue-Marine Service.

SPEAR-HEADS.

Consist of two parts: A carved, barbed bone, which is pointed and fits into head of wooden shaft, and a metal head, barbed, which is lashed in a slot in outer end of the bone head. From Anderson River. Lengths, $6\frac{1}{2}$ inches to 1 foot 2 inches. British America, 1867. Collected by Robert Macfarlane. Nos. 7,420, 2,431, and four specimens, No. 2,675.

FISH-SPEAR.

Shaft of cedar, $\frac{1}{2}$ inch in diameter, painted red, and end enlarged into a head, in outer end of which is inserted and lashed a flat

FISH-SPEAR—Continued.

barbed piece of bone 1 foot in length. In a slot in outer end of latter is lashed a metal spear-head. Used in fishing by Alaskan Indians, Sitka. Length, 4 feet 9 inches; point, 3 inches. Alaska, 1867. 5,775. Collected by Captain Howard, U. S. Revenue-Marine Service.

SPEAR-HEAD.

Carved from elk-horn, barbed and pointed. Used in fishing. Length, 7½ inches. Northwest coast, 1868. 5,714. Collected by George Gibbs.

FISH-SPEAR HEADS (2).

Thin iron heads, with one deep barb; two bone barbs on shank form socket for staff; secured by serving of bark and pitch. Short lanyard of sennit. Made by Indians. Length, 4½ inches. Columbia River, 1841. 2,628. United States Exploring Expedition, Capt. Charles Wilkes, U. S. N., commanding.

FISH-SPEAR.

Handle, red wood; two prongs, whalebone, with ivory barbs lashed at tips with reindeer sinew; central spear ivory, with one small barb. Length, 90 inches. Tschutschi Indians. 2,543. Capt. John Rodgers, North Pacific Exploring Expedition.

FISH-SPEAR.

Pole, spruce; two prongs and barbs, bone; barbs fastened to wooden pegs with seal sinew. Central piece ivory, barbless, lashed with seal sinew. Length, 64 inches. Norton Sound, Alaska. 33,861. Collected by E. W. Nelson.

FISH-SPEARS.

Light shafts of cedar, fitted with adjustable heads of ivory, mortised into and lashed to ends of shafts. In ends of heads are wooden plugs, in which fit barbed ivory points secured to heads with lanyards. The butt ends are fitted with feathers, and to the shafts are attached lanyards for the harpoon lines. Used in fishing by Alaskan Indians of Norton Sound and elsewhere. Length, 4 to 4½ feet; heads, 3 to 7 inches in length; points, 1½ to 3 inches. Alaska. 36,099, 34,035, 33,989, 33,906, 29,808, 11,852, 36,191, 33,921, 33,927, 29,806, 48,364, 48,153, 15,681, 15,677, 8,006, 8,005, 11,348, 72,414. Collected by E. W. Nelson, L. M. Turner, W. H. Dall, and others.

SPEAR.

Staff of cedar, 1 inch in diameter, pointed at one end and beveled at the other, the latter being shod with a flat, pointed, and

SPEAR—Continued.

barbed piece of bone 1 foot and 1 inch in length and 1¼ inches in width. Used in fishing by Indians of Lower Yukon River. Length, 4 feet. Alaska, 1879. 36,070. Collected by E. W. Nelson.

FISH SPEAR OR GIG.

Rough tip, made of two pieces of bone, fastened together by sinew and pitch, fitted over the ends of rough wooden shanks of unequal length, which are secured to a stout staff by a serving made of cedar roots. The line, fastened to the tips, is of twisted rawhide or sinew. Made by Clallam Indians. Length, 53 inches. Washington Territory, 1876. 23,522. James G. Swan.

FISH-SPEAR.

Model of the kind of salmon-spear used by the Eskimo of Hudson Bay. Wooden handle, with central barbless spear, brass, and two projecting prongs, wood, armed each with a bent tack. Length, 13¾ inches. New Bedford, Mass., 1882. U. S. Fish Commission. This model was made by a native at the request of a whaleman. It is said to be a correct representation of the large size employed by the Eskimo, with the exception of the tacks, intended as barbs, as well as the spear, which are made of bone. Obtained from the crew of the whaling brig George and Mary.

FISH-SPEAR.

Pole, wood; prongs, walrus ivory, with triangular barbs fastened with pegs and lashed with sealskin; central spear, barbless. Length, 70½ inches. Norton Sound, Alaska. Collected by E. W. Nelson.

SPEAR FOR WHITEFISH.

Three short, slightly converging ivory barbs, serrated on inner edges, surrounding a shorter, straight point, secured to end of long, light cedar staff by an ivory collar and serving of twisted sinew. Length, 49 inches. Nunivak Island, Alaska, 1880. 48,343. Collected by E. W. Nelson.

FISH-SPEAR.

Pole, wood; two bone spears, with two notches each, lashed to pole with seal-thong. Length, 58½ inches. Rasboinsky, Alaska. 49,049. Collected by E. W. Nelson.

FISH-SPEAR.

Pole, spruce; two bone prongs recurved, with bone barbs lashed with seal-skin; central spear, bone, with two notches; pole partly painted brick-dust red. Length, 71 inches. Rasboinsky, Alaska. 49,051. Collected by E. W. Nelson.

FISH-SPEAR.

Pine pole; two projecting prongs, with single rigid barbs and one central barbless spear lashed to the tip of pole with seal sinew. Length, 34 inches. Bristol Bay, Alaska. 55,922. Collected by C. L. McKay. Used for the capture of salmon and white-fish.

FISH AND BIRD SPEAR.

Slender pole with finger-rest, with five spear-heads with two barbs each on one side, for killing fish and ducks, principally the latter. Length, 10 feet 6 inches. Makah Indians, Neah Bay, Washington Territory. 72,672. "At certain times, during stormy weather, the wild fowl congregate in vast numbers in Neah Bay. The Indians go out in their canoes with a bright light from torches of pitchwood placed in the stern. The canoe is paddled stern first among the flocks of wild fowl. The birds, bewildered by the light, are killed in great numbers. The prongs of the spear get entangled among the feathers and hold fast. A bird is hauled in the canoe, its neck wrung, and others in succession quickly speared. Sometimes as many as one hundred canoes will be out at the same time, and the light from their torches moving about on the water on a dark night is a very interesting sight."—(*J. G. Swan.*)

BIRD AND FISH SPEAR.

Three long diverging barbs, serrated on inner edges, lashed to the end of a cedar shaft. Length, 54 inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,794. Lieut. P. H. Ray, U. S. A.

SPEARS WITH DETACHABLE HEADS.

LILY-IRONS.

SWORD-FISH DART-HEADS.

Four varieties of Cape Cod patterns, made of galvanized iron and composition. Wilcox, Crittenden & Co. 29,458.

SWORD-FISH DARTS.

Four varieties, made of composition; used by fishermen of Maine. Wilcox, Crittenden & Co. 29,422.

SWORD-FISH DARTS.

Gloucester patterns; series of four sizes and styles, made of galvanized iron and composition. Wilcox, Crittenden & Co. 29,421.

SWORD-FISH DARTS.

Provincetown patterns. Wilcox, Crittenden & Co. 29,386.

SWORD-FISH LILY-IRONS.

Two samples of Gloucester patterns. Adolph Voss. 32,714, 32,715.

SWORD-FISH LILY-IRON.

The double lance-head or lily-iron, 3 inches long, fits on an iron shank 4 feet long, and this shank to a wooden pole 8 feet long; grommet-strap, 23 inches long, fastened to lily-iron; short strap attached to head of shank for long warp. Gloucester, Mass., 1878. 32,703. Made by Vinal McCaleb. Used by Gloucester fishermen in the capture of codfish.

SWORD-FISH LILY-IRON. (Allen's patent.)

Rigged for use. Movable catch to hold toggle. Length of iron, 5 inches; iron shank, 22½ inches long, attached to a pole 10 feet long; grommet-strap, 18 inches long, fastened to lily-iron and attached to a line. Second line, to haul back the pole, fastened to cleat to keep it taut from the iron. Cuttyhunk, Mass., 1883. 57,078. U. S. Fish Commission.

SWORD-FISH LILY-IRON. (Allen's patent.)

Rigged for use. Movable catch to hold the toggle in place. Lines attached to pole and iron. Cuttyhunk, Mass., 1883. 57,079. Frederick S. Allen. "This iron can be used for sword-fish or other soft-meated fish. When the movable catch that holds the toggle strikes the skin of the fish it unlocks the iron, but nevertheless will remain in position as long as it continues going. When the action is reversed, or the iron drawn out, it immediately toggles or comes crossways. Then the long shank can be easily pulled out of the short or lower shank by means of the small line attached to the end of the pole. The fish then remains fastened by the iron and held by the long line."—(*F. S. Allen.*)

PORPOISE-IRON.

Very old style, used by Provincetown fishermen. 29,504. Isaiah A. Small.

TOGGLE-IRON.

Toggle made of hoop-iron held by a rope grommet; roughly made pole; socket served and iron-strap attached. Length, 9 feet. New Bedford, Mass., 1882. 57,698. Gift of Jonathan Bourne. A peculiar harpoon, made on board ship, probably by the blacksmith. Evidently intended for striking blackfish or porpoise.

TOGGLE-IRON.

Head and portion of shank of toggle-iron. Joggle wrought-iron, elongated point, fluked at rear end, slotted and pivoted to end

TOGGLE-IRON—Continued.

of shank. Intended to be used in striking sword-fish or porpoises. Length, $10\frac{3}{4}$ inches. 56,409. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of toggle-iron. Evidently intended for striking sword-fish, porpoises, and blackfish. Head, steel, mortised; shank, wrought-iron. Length, 10 inches. 56,407. Gift of A. R. Crittenden.

TOGGLE-IRON.

Head and portion of shank of toggle-iron. Evidently a kind of lily-iron intended to be used for striking the sword-fish or porpoise. Toggle with double diamond point; slotted and hinged at center to end of shank; shank wrought-iron. Length, $10\frac{1}{2}$ inches. 56,406. Gift of A. R. Crittenden.

TURTLE-PEG HARPOON.

A dart or harpoon about two inches long, with lines attached; head to set in pole. Key West, Fla., 1880. 39,427. Gift of Dr. J. W. Velie. Used on the southern coast for the capture of turtles.

LILY-IRON.

Sample of an improved form of lily-iron used in the capture of swordfish off the New England coast. Exhibited by William Taylor, Portland, Me.

MODERN HARPOONS.

(See catalogue of "The Whale Fishery and its Appliances.")

ABORIGINAL HARPOONS.

Fish harpoons.

FISH-SPEAR. (Model.)

Long, light, bone head, driven into slender cedar staff and secured by seizing of fine sinew; wooden socket in end receives detachable barbed ivory tip, through which is rove the line made of sinew sennit. Length: staff, 23 inches; head, $7\frac{3}{4}$ inches; tip, $1\frac{1}{8}$ inches. Alaska, 1857. 2,530. U. S. Pacific Exploring Expedition, Commodore John Rodgers, U. S. N., commanding.

FISH-SPEAR.

Long, round, bone head, bifurcated to receive light wooden shaft and secured by serving of fine sinew. Wooden socket in end receives small detachable ivory tip, through which is rove the line made of sinew sennit. Length: staff, $43\frac{1}{4}$ inches; head, 8 inches; tip, $2\frac{1}{2}$ inches. Alaska, 1857. 2,530–2. U.S. Pacific Exploring Expedition, Commodore John Rodgers, U. S. N. commanding.

FISH-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew. Wooden socket in end receives small detachable ivory tip, through which is rove the line made of sinew sennit. Length: shaft, 42 inches; head, 6 inches; tip, 2 inches. Alaska, 1857. 2,530–2. U. S. Pacific Exploring Expedition, Commodore John Rodgers, U. S. N., commanding.

FISH-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew. Wooden socket in end receives detachable barbed ivory tip, through which is rove the line, made of twisted hemp cord. Length: staff, 43 inches; head, 9 inches; tip, 2 inches. Alaska, 1857. 2,530–4. U. S. Pacific Exploring Expedition, Commodore John Rodgers, U. S. N., commanding.

FISH-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew. Wooden socket in end receives detachable barbed ivory tip, through which is rove the line, made of twisted vegetable fiber. Length: shaft, 42 inches; head $9\frac{1}{2}$ inches; tip, $2\frac{1}{2}$ inches. Alaska, 1,857. 2,530–5. U. S. Pacific Exploring Expedition, Commodore John Rodgers, U. S. N., commanding.

FISH-SPEAR.

Long, round head of bone, driven into light cedar staff and secured by seizing of fine sinew. Wooden socket in end receives detachable tip, through which is rove line made of fine cotton-twine sennit. Length: staff, $41\frac{1}{2}$ inches; head and tip, $10\frac{3}{4}$ inches. Sitka, Alaska, 1868. 5,779. Capt. W. A. Howard, U. S. R. M.

FISH-SPEAR.

Heavy bone head, driven into light cedar staff and secured by seizing of fine sinew. Wooden socket in end receives detachable barbed ivory tip, through which is rove the line, made of walrus or sealskin. Length: staff, 19 inches; head, 5 inches; tip, $2\frac{1}{2}$ inches. Kotzebue Sound, Alaska, 1875. 16,675. W. H. Dall.

FISH SPEAR OR GIG (Quating).

Double, detachable points, ingeniously made by passing a small piece of deer-horn, sharpened at each end, through a socket, and securing it with seizing and pitch. The socket is large enough to receive end of shank. Line of twisted vegetable fiber fastened to middle of points to insure toggling when fish

FISH SPEAR OR GIG—Continued.

is struck. Made by Pai Ute Indians. Length: staff, 24 inches; points, 2½ inches. Pyramid Lake, Nevada, 1875. 19,046. Stephen Powers.

SALMON-SPEAR.

Two prongs, ½ inch in diameter, seized to slender pole 1 inch in diameter. Used with detachable heads, made from the splint bones of deer (heads wanting), in the capture of salmon. Length, 23½ feet. McCloud River Indians, Shasta County, California. 21,413. Livingston Stone.

FISH SPEAR OR GIG (Korontoomul).

Detachable tips, made of short iron points and wooden barbs lashed by a seizing of twine and pitch, fit over the end of rough wooden staff—staff has been broken. The line attached to these tips is of modern manufacture. Made by Hoochnowe Indians. Length: staff, 34¼ inches; tips, 3 inches. South Eel River, California, 1876. 21,413 (*a*). Stephen Powers.

FISH-SPEAR HEADS (2), (Milkayt).

Large, flat, elk-horn points and double barbs, fastened together with serving of vegetable fiber and pitch, form a socket for the insertion of the shaft of the spear, to which the detachable points are fastened by a leather lanyard. Made by Hoopa Indians. Length, 4¾ and 6 inches. Hoopa Valley, California, 1876. 21,308. Stephen Powers.

HEAD OF FISH-DART.

Made of native copper; five barbs on each side; through the shank is rove a strap made of braided sinew. Length, 7 inches. Fort Simpson, British Columbia, 1876. 20,653. Collected by James G. Swan.

HEAD OF FISH-DART.

Made of native copper; five long barbs on one side. Length, 8 inches. Alaska, 1869. 9,083. Lieut. F. W. Ring, U. S. Army.

HEAD OF FISH-DART.

Made of native copper, by Eskimo; six barbs on one side. Length, 6 inches. Sitka, Alaska, 1868. 6,564 (*a*). Dr. T. T. Minor.

HEAD OF FISH-DART.

Made of native copper, by Eskimo; five barbs on one side. Length, 5½ inches. Sitka, Alaska, 1868. 6,564. Dr. T. T. Minor.

Seal, walrus, and sea-otter harpoons.

SEAL SPEAR AND BUOY.

A short, heavy head of bone or horn, into which is driven a stout staff of cedar, secured by a becket; wooden socket in the end receives adjustable tip of bone, barbed on each side, to which is fastened the line made of stout walrus or seal hide. On one side of the staff, about its middle, is fastened a curved bone pin, against which the forefinger presses to strengthen the grip when hurling. A buoy, made of seal bladder, is attached to staff near its butt. Length: staff, 39 inches; head, 6 inches; tip, $2\frac{3}{4}$ inches. St. Michael's, Norton Sound, Alaska, 1876. 29,841. Collected by L. M. Turner.

SEAL HARPOON AND BUOY.

A short, heavy head of bone or horn, into which is driven a stout staff of cedar secured by a becket; a wooden socket in the end receives adjustable tip of bone, barbed on each side, to which is fastened the line, made of stout walrus or seal hide; on one side of the staff, about its middle, is fastened a curved bone pin, against which the forefinger presses to strengthen the grip when hurling. A buoy made of seal bladder is attached to staff near its butt. Length: staff, $49\frac{1}{4}$ inches; head 5 inches; tip, $2\frac{1}{2}$ inches. St. Michael's, Norton Sound, Alaska, 1878. 33,863. Collected by E. W. Nelson.

SEAL AND BELUGA HARPOON AND BUOY.

A long, heavy head of bone or horn, into which is driven a stout staff of cedar, secured by a becket; wooden socket in the end receives adjustable tip of bone, barbed on each side, to which is fastened the line, made of stout walrus or seal hide; a buoy made of seal-bladder is attached to staff near its butt. Length: staff, $52\frac{1}{2}$ inches; head, $6\frac{1}{2}$ inches; tip, $4\frac{1}{2}$ inches. St. Michael's, Norton Sound, Alaska, 1878. 33,939. Collected by E. W. Nelson. Used after the seal or beluga has been struck with another spear in order to prevent it from sinking. The float is inflated when in use; at other times it is folded around the staff.

SEAL AND BELUGA HARPOON AND BUOY.

A short, heavy head of bone or horn, into which is driven a stout staff of cedar, secured by a pin; a wooden socket in the end receives adjustable tip of bone, barbed on each side, to which is fastened the line, made of stout walrus or seal hide; a buoy, made of seal-bladder, is attached to a staff near its butt. Length: staff, $47\frac{1}{4}$ inches; head, $3\frac{1}{2}$ inches; tip, 4 inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,940. Collected by E. W. Nelson.

SEAL SPEAR AND BUOY.

A short, round, ivory head, driven into a long, light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed ivory tip, to which is fastened the line, made of sinew sennit. Small buoy, made of seal intestine, is attached to staff near butt. Length: staff, 45 inches; head, $2\frac{1}{2}$ inches; tip, $4\frac{1}{2}$ inches. Bristol Bay, Alaska, 1882. 72,415. Collected by Charles L. McKay.

SEAL SPEAR AND BUOY.

A short, round, ivory head, driven into long, light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed ivory tip, to which is fastened the line, made of sinew sennit. Small buoy made of seal intestine is attached to staff near butt. Made by Eskimo. Length: staff, $46\frac{3}{4}$ inches; head, $3\frac{1}{8}$ inches. Bristol Bay, Alaska, 1872. 11,356. Vincent Colyer.

SEAL SPEAR AND BUOY.

A short, round, ivory head, driven into long, light cedar staff, and secured by serving of fine sinew; wooden socket in end receives adjustable barbed ivory tip, to which is fastened the line, made of sinew sennit. Small buoy, made of seal intestine, is attached to staff near butt. Length: staff, $44\frac{1}{2}$ inches; head, 3 inches; tip, $3\frac{1}{2}$ inches. Nushegag Indians, Alaska, 1869 7,998. Dr. T. T. Minor.

HARPOONS, LINES, AND FLOATS. (3 models.)

Harpoon-heads have copper blades, with ivory wings or barbs; lines made of twisted fiber, served with twine; floats, wood carved in imitation of seal-skin buoys. Made by Makah Indians. Neah Bay, Washington Territory. 4,131. Collected by James G. Swan.

HARPOON WITH BLADDER-FLOAT.

Pole, wood, painted black, striped with dull red; tip served with seal sinew and recessed for harpoon-head; harpoon, bone, two barbed notches, attached to line with seal thong; line, probably seal sinew, fastened to pole; float-bladder of seal, old, lashed to pole with seal sinew; ivory plug, ornamented, inserted in neck of bladder to be used when the bladder is inflated; finger-rest, horn. Length, 14 feet. Kodiak, Alaska. 11,362. Vincent Colyer.

SEAL-HARPOON.

Eskimo, Igloolik. 10,400. Collected by Capt. C. F. Hall.

SEAL-SPEAR (model.)

Arrow-shaped, adjustable ivory head, with iron blade; long, ivory shank in cedar staff. Line, fine sinew sennit. Length, 18 inches. Anderson River District, 1866. 1,678. R. Macfarlane.

SEAL-HARPOON.

Heavy, ivory head, driven into light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 47½ inches; head, 3½ inches; tip, 2½ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,871. Collected by E. W. Nelson.

ESKIMO SEAL-HARPOON.

Pole, wood, 1 inch in diameter; butt recessed to receive a recurved bone spear, which is lashed with seal-skin; ivory peg for grip, lashed to pole with seal-skin; tip mounted with a bulb-like ivory head recessed for shank; shank, ivory, fastened to line with a seal-skin lanyard or becket; lily-iron, ivory, tipped with iron; rigid eye for line; seal-skin line attached to head. Total length, 9 feet 2 inches. Norton Sound, Alaska, 1874. 33,888. Collected by E. W. Nelson. Combined harpoon and lance, manufactured and used by natives in the capture of seal.

SEAL-HARPOON.

Heavy, ivory head, driven into light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 44 inches; head, 4⅝ inches; tip, 3½ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,909. Collected by E. W. Nelson.

SEAL-HARPOON.

Heavy, ivory head, driven into light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable tip, to which is fastened the line. Length: staff, 51¾ inches; head, 4 inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,925. Collected by E. W. Nelson.

HARPOONS.

Shafts of cedar, oval in cross-section, fitted into bone heads, in outer end of which are wooden plugs in which are inserted barbed-bone points secured to heads by lanyards. On middle of shafts are fastened bone finger-cleats, and near ends are lashed seal-bladder buoys, with bone mouth-pieces; harpoon line is attached to lanyard of shaft. Length, 4 to 5 feet; bone heads, 7 inches; points, 3 to 5 inches. Alaska. Collected by

HARPOONS—Continued.

E. W. Nelson and L. M. Turner. 33,936, 29,040, 33,911, 33,912, 33,930, 33,938, 33,864, 33,975, 33,933. Used by Alaskan Indians of Norton Sound and elsewhere in seal and beluga hunting, and thrown after the game has been previously speared to prevent them from sinking or escaping.

SEAL-HARPOON.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 44 inches; head, 4 inches; tip, 3 inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,961. Collected by E. W. Nelson.

HARPOON OR SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 49¼ inches; head, 4 inches; tip, 2¾ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,977. Collected by E. W. Nelson.

HARPOON OR SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 46½ inches; head, 3¾ inches; tip, 2½ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,979. Collected by E. W. Nelson.

HARPOON OR SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 46½ inches; head, 3⅝ inches; tip, 2½ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,983. Collected by E. W. Nelson.

HARPOON OR SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 45 inches; head, 4 inches; tip, 3 inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,984. Collected by E. W. Nelson.

HARPOON OR SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 44¾ inches; head, 3¾ inches; tip, 2 inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,986. Collected by E. W. Nelson.

HARPOON OR SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 45½ inches; head, 4 inches; tip, 2½ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,987. Collected by E. W. Nelson.

HARPOON OR SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line, made of seal or walrus hide. Length: staff, 45 inches; head, 4½ inches; tip, 3½ inches. Saint Michael's, Norton Sound, Alaska, 1878. 34,007. Collected by E. W. Nelson.

SEAL-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives detachable barbed ivory tip, through which the line is rove. Length: staff, 48½ inches; head, 5 inches; tip, 2½ inches. Lower Yukon River, Alaska, 1879. 36,088. Collected by E. W. Nelson.

SEAL-HARPOON.

Pole, wood; lance, walrus ivory, seized to butt with seal thongs; grip, ivory, carved in imitation of head of seal; tip of pole served with alternate layers of black and transparent strips of baleen; head-piece, ivory, recessed for ivory shank, lashed to pole with a seal thong. Harpoon wanting. Length, 11 feet. Golofnin Bay, Alaska. 43,346. Collected by E. W. Nelson. Harpoon and lance combined.

SEAL-SPEAR (toy model).

Arrow-shaped iron blade in adjustable ivory head, with ivory shank. Cedar staff. Length, 13½ inches. Cape Nome, Alaska, 1880. 44,666. Collected by E. W. Nelson.

SEAL-SPEAR.

Pole, wood; spear or lance, bone, lashed to butt with a seal thong; grip, ivory, carved in imitation of head of seal, lashed to cen-

SEAL-SPEAR—Continued.

tral part of pole; tip of pole served with strips of baleen; head-piece, ivory, recessed for ivory shank, lashed to pole with a seal thong. Harpoon wanting. Length, 9 feet 5 inches. Sledge Island, Alaska. 45,418. Collected by E. W. Nelson. Harpoon and lance or spear combined.

SEAL-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives detachable barbed ivory tip, through which the line is rove. Length: staff, 46½ inches; head and tip, 5½ inches. Cape Darby, Alaska, 1880. 45,428. Collected by E. W. Nelson.

SEAL-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives detachable barbed ivory tip, through which the line is rove. Length: staff, 45 inches; head and tip, 7 inches. Cape Nome, Alaska, 1880. 45,429. Collected by E. W. Nelson.

SEAL-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives detachable ivory tip, through which the line is rove. Length: staff, 45½ inches; head, 4 inches; tip, 2½ inches. Cape Nome, Alaska, 1880. 45,430. Collected by E. W. Nelson.

SEAL-SPEAR.

Heavy, bone head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives detachable barbed ivory tip, through which the line is rove. Length: staff 46½ inches; head and tip, 7 inches. Sledge Island, Alaska, 1880. 48,156. Collected by E. W. Nelson.

SEAL-HARPOON.

Pole, wood; spear or lance, ivory, seized to butt with seal-skin; grip, ivory; head-piece and shank, walrus ivory; tip of pole served with seal sinews. Harpoon wanting. Length, 9 feet 6 inches. Port Clarence, Alaska. 48,429. Collected by E. W. Nelson. Harpoon and lance or spear combined.

SEAL-SPEAR HEADS AND LANYARDS.

A slender staff or pole, with two prongs of unequal lengths, upon which are placed respectively two metal heads with one barb each. The spear-heads are held in place by lanyards, which are hauled taut and firmly grasped with the pole in the left

SEAL-SPEAR HEADS AND LANYARDS—Continued.

hand. When used, the ends of the lanyards are attached to a long line, one end of which remains in the boat. The butt of the pole is provided with a flaring piece of wood, which is used as a finger-rest when the Indian thrusts the instrument into the seal. Length, 15 feet 10 inches. Makah Indians, Neah Bay, Washington Territory. 72,671. James G. Swan.

"Used by the natives in killing fur-seals. The canoe is paddled silently to a short distance from the sleeping seal and the spear thrust forcibly into the animal. The canoe is hauled by means of the rope closer to the seal, which is dispatched by a blow on the head with a club. The Indians invariably smash in the skull of a seal even when the animal is killed by the thrust of the spear, which is frequently the case. So universal is this practice that I was unable, during a residence of three years at Neah Bay, to obtain a perfect specimen of a skull, although hundreds of skulls may be seen on the beach any day during the sealing season, but every one was fractured."—(*J. G. Swan.*)

SEAL-SPEAR.

Head made of a slightly curved piece of walrus ivory, driven into a light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable double-barbed tip, to which is fastened the line, made of sinew sennit. Length: staff, 50¾ inches; head, 7¼ inches; tip, 1½ inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,789. Lieut. P. H. Ray, U. S. A.

SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives detachable barbed tip, to which is fastened the line made of twisted sinew. Length: staff, 52¾ inches; head, 5 inches; tip, 2 inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,790. Collected by Lieut. P. H. Ray, U. S. A.

SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line made of sinew sennit. Length: staff, 44 inches; head, 5½ inches; tip, 1¾ inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,791. Collected by Lieut. P. H. Ray, U. S. A.

SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line made of sinew sennit.

SEAL-SPEAR—Continued.

Length: staff, 52 inches; head, $6\frac{1}{4}$ inches; tip, $1\frac{3}{4}$ inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,792. Collected by Lieut. P. H. Ray, U. S. A.

SEAL-SPEAR.

Heavy, ivory head, driven into light cedar staff and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed tip, to which is fastened the line made of sinew sennit. Length: staff, $49\frac{3}{4}$ inches; head, 6 inches; tip, $1\frac{1}{2}$ inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,793. Collected by Lieut. P. H. Ray, U. S. A.

SEAL-SPEAR. (Model.)

Ivory, arrow-shaped, adjustable head, with long shank in cedar staff. Length, $20\frac{1}{2}$ inches. Saint Lawrence Island, Alaska, 1874. 15,631. Collected by H. W. Elliott.

SEAL-SPEAR.

Frobisher Bay, 1864–'69. 10,264. Collected by Capt. C. F. Hall.

SEAL SPEAR OR LANCE.

Long, round, ivory blade, in larger ivory shank; secured in heavy cedar staff by serving of sinew sennit. Length, 58 inches. King William's Land, 1864. 10,271. Collected by Capt. C. F. Hall.

SEAL-SPEAR.

Four conjoined pieces; lance-point, bone, rigidly fastened into the recessed bulb-shaped end of shank; shank, walrus bone, chamfered at rear extremity and lashed to the handle with seal-sinew; handle, wood; butt, recessed; small bone butt-piece inserted in recess and lashed with seal-skin; lance-strap seal-skin. Length, 65 inches. King William's Land, 1864–'69. 10,272. Collected by Capt. C. F. Hall.

SEAL AND WALRUS SPEAR.

A short, round, ivory head, rudely ornamented with incised lines, driven into heavy cedar handle and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed ivory tip, to which is fastened the line, made of sinew sennit; small ivory pin in butt. Length: Staff, $51\frac{1}{2}$ inches; head, $4\frac{1}{4}$ inches; tip, $3\frac{1}{2}$ inches. Nunivak Island, Alaska, 1880. 48,372. Collected by E. W. Nelson.

MINIATURE HARPOON (Oon-a-gag-u-uk).

Blade, head, and shank, ivory; cedar staff; line, thin strip of seal-skin. Length, $16\frac{1}{2}$ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,840. Collected by E. W. Nelson.

ESKIMO HARPOON.

Handle, wood, tipped with head of an animal carved in bone; bone shank inserted in recess of tip and lashed with rawhide to handle; end of handle near tip served with strips of baleen and rawhide; small seal head carved in bone and seized to central part of handle, used as a finger rest and as a stop for the line. Wanting, harpoon butt and head. Total length, 54 inches. Sledge Island, Alaska. 45,415. Collected by E. W. Nelson.

WALRUS HARPOONS.

Common toggle-irons; shanks, wrought iron; toggles, malleable cast iron, mortised; stamped "L. Cole" (manufacturer). Total length (56,415), 22 inches; total length (56,413), 22½ inches; length of toggles, 6 inches. Fairhaven, Mass., 1883. U. S. Fish Commission. Used by whalemen in the Arctic Regions in the capture of walrus.

WALRUS-SPEAR.

Detachable head, bone, tipped with slate; lashed with raw hide to a light wooden handle. Total length, 24½ inches. Bristol Bay, Alaska, 1882. 72,418. Collected by Chas. L. McKay.

WALRUS-HARPOON.

End recessed for pole; rigid eye for lanyard. Length, 5 inches. Eskimo, Igloolik. 10,136. Collected by Capt. C. F. Hall.

SEA-OTTER SPEAR AND BUOY.

A short, round, ivory head, driven into long, light cedar staff, and secured by seizing of fine sinew; wooden socket in end receives adjustable barbed ivory tip, to which is fastened the line, made of sinew sennit. Small buoy, made of seal intestine, is attached to staff near butt. Length: staff, 45¾ inches; head, 3 inches; tip, 5 inches. Tshernoburo Island, Cook's Inlet, Alaska, 1882. 72,518. Collected by William J. Fisher. Native names: The whole spear, Pi-shu-dak; socket or bone head, Kag-li-shwik; bladder, Ak-tshuk; line, Puhn-ak; staff, Tu-puh-gat; tip, Tshi-guik.

HARPOON-HEAD AND FLOAT-LINE.

Head, walrus ivory, with iron tip riveted with native copper; line, walrus hide; bight caught in rigid eye of harpoon and seized with strips of baleen. Length of head, 4⅜ inches; of line, 107 feet. Point Tchaptin, Siberia. 49,151. Collected by E. W. Nelson.

HARPOON LINE AND HEAD.

Line, walrus-hide; head, bone, tipped with brass, fastened to line by means of a small lanyard and an ivory toggle. Used by natives in capturing the beluga. Length of line, 68 feet. Bristol Bay, Alaska, 1882. 72,397. Collected by C. L. McKay.

THREE HARPOON-HEADS.

Bone and iron; recessed in rear end for poles; rigid eyes for lanyards. Length, $4\frac{7}{8}$, $5\frac{3}{8}$, and $5\frac{5}{8}$ inches. Eskimo, Northeast coast. 9,838. Presented by Prof. Spencer F. Baird.

HARPOON-HEAD.

Bone, tipped with iron. Used in beluga-fishing, with the accompanying harpoon-shafts (72,392–3). Length, $9\frac{1}{4}$ inches. Bristol Bay, Alaska, 1882. 72,394. Collected by C. L. McKay.

HARPOON-HEAD.

Cut from bone; fitted in one end with a wooden plug for inserting barbed point, and mortised in other end for attachment to shaft. Used by Tschutschi Indians, Northwest coast. Length, 10 inches; diameter, $1\frac{1}{2}$ inches; mortise, 2 inches long. Northwest coast, 1857. 2,538. Collected by Commodore John Rodgers, U. S. N.

HARPOON-HEAD.

Part of ancient Innuit harpoon-head; bone. Length, $3\frac{3}{4}$ inches. Repulse Bay. 10,404. Collected by Capt. C. F. Hall.

IRON HARPOON-HEAD.

Line of walrus hide. Smith Sound. 14,255. Collected by Capt. C. F. Hall. Used by Eskimo.

THREE HARPOON-HEADS.

Ivory, tipped with iron; recessed for poles, and eyes for laynards. Tip of one broken. Length, $4\frac{1}{8}$, $4\frac{3}{4}$, and $5\frac{1}{8}$ inches. Eskimos, Cumberland Gulf. 29,974. Collected by W. A. Mintzer, U. S. N.

HARPOON-HEAD.

Bone and iron; recessed for pole; rigid eye for laynard. Length, $5\frac{1}{2}$ inches. Cumberland Gulf. 29,975. W. A. Mintzer, U. S. N. Used by Eskimo.

HARPOON-HEAD.

Bone, with walrus-hide line. Port Foulke. 565. Collected by Dr. I. I. Hayes. Used by Eskimo.

HARPOON-HEADS (40).

Ivory or bone "lily-irons" and shanks, with blades of bone, ivory-flint, slate, iron, and copper; inserted into ends of harpoon, staves. The line is fastened to these heads, which become detached when the animal is struck; some are provided with wooden caps. Length, 3 to 13 inches. Alaska.

HARPOON-HEAD.

Detachable head tipped with iron; rear end bifurcate; raw-hide strap. Length of head, 5½ inches. Nunivak Island, Alaska. 48,241. Collected by E. W. Nelson.

HARPOON-HEAD.

Detachable head of bone, with iron tip; rear part of head bifurcated; strap, raw hide. Wooden neck or shank inserted in recess of head, and fastened to strap with a small raw-hide becket. Length, 5½ inches. Nunivak Island, Alaska. 48,240. Collected by E. W. Nelson.

HARPOON-HEAD.

Detachable harpoon-head, made of bone and iron. Length, 5⅞ inches. Big Diomede Island, Alaska. 46,373. Collected by Dr. T. H. Bean. Used by Eskimo.

HARPOON-HEAD.

Detachable harpoon-head; bone, with iron tip. Length, 6 inches. Eskimo, Cape Estenberg, Kotzebue Sound. Collected by Dr. T. H. Bean.

SPEAR-HEAD.

Detachable; made of bone; two deep barbs on blade and two on shank, forming socket for staff; secured by serving of sinew and pitch. Made by Indians. Length, 7½ inches. New Mexico, 1866. 1,439. Lieutenant Whipple, U. S. A.

HARPOON-HEAD.

Detachable bone harpoon-head, tipped with brass; recessed for end of pole; eye for strap; strap, raw hide. Length of head, 4¾ inches; length of strap, 12 inches. Ooglaamie, Point Barrow, Alaska, 1882. 56,623. Collected by Lieut. P. H. Ray, U. S. A.

HARPOON-HEAD.

Detachable harpoon-head, bone, tipped with slate; line for bending on buoy, rawhide. Length of head, 4¾ inches. Ooglaamie, Point Barrow, Alaska, 1882. 56,612. Lieut. P. H. Ray, U. S. A.

HARPOON-HEAD.

A detachable harpoon-head, bone, tipped with brass. Length, 9 inches. Ooglaamie, Point Barrow, Alaska, 1882. 56,601. Lieut. P. H. Ray, U. S. A.

BONE HARPOON-HEAD.

Length, 7½ inches. Bristol Bay, Alaska, 1882. 72,395. Collected by C. L. McKay.

SALMON SPEAR-HEADS (2.)

Straight iron points, with bone barbs forming socket; wrapped with bark of spruce root (?) and thickly pitched; joined by rawhide ganging. Quilleute Indians, about thirty miles south of Cape Flattery. Length, 4 inches. Washington Territory, 1883. 72,839. James G. Swan, Port Townsend, Wash. Used on a pole with two prongs like seal spears.

SEAL HARPOON-HEAD.

Walrus ivory, tipped with brass; lanyard, seal-hide. Length of head, 3 inches; of lanyard, 8 feet 8 inches. Cape Lisburne, Alaska. 49,034. Collected by W. H. Dall. Made and used by Eskimo.

SEAL HARPOON-HEAD.

Walrus ivory, with brass tip; lanyard, rawhide, seized with sinew of seal. Length of head, 3⅞ inches; of lanyard, 16¾ inches. Eskimo, Cape Lisburne. 46,038. Collected by W. H. Dall.

SEAL HARPOON-HEAD.

Walrus ivory, tipped with iron; lanyard of rawhide; bights seized with seal sinew. Length of head, 3 inches; of lanyard, 51 inches. Cape Lisburne, Alaska. 46,035. Collected by Wm. H. Dall. Made and used by Eskimo.

SEAL HARPOON-HEAD.

Ivory, tipped with brass; lanyard, rawhide, seized with seal sinews. Length of head, 3⅛ inches; of lanyard, 13 inches. Eskimo, Cape Lisburne. 46,033. Collected by Wm. H. Dall.

SEAL HARPOON-HEAD.

Walrus ivory, tipped with brass; new; lanyard, rawhide; bight seized with seal sinew. Length of head, 3 inches; of lanyard, 59 inches. Eskimo, Cape Lisburne, Arctic Ocean. 46,032. Collected by Wm. H. Dall.

SEAL HARPOON-HEAD.

Walrus ivory, with brass tip riveted with native copper; lanyard, rawhide; bights in the ends of lanyard seized with seal sinew.

SEAL HARPOON-HEAD—Continued.

Length of head, 3 inches; of lanyard, 40 inches. Cape Lisburne, Arctic Ocean. 3,627. Collected by W. H. Dall. Old; has been used.

SPEAR-HEADS (3).

Bone, ivory, and wooden shafts, 6 to 13 inches long and ¼ inch in diameter, pointed at one end for inserting in shaft of spear, and having lashed in slot in other end metal-barbed arrowheads. N. W. Coast of America, 1841. 2,627, 2,693. U. S. Exploring Expedition, Capt. Charles Wilkes, U. S. N., commanding.

SPEAR-HEAD.

Bone head, in one end of which is riveted a barbed metal head 3 inches long, and in the other a slot 2¼ inches long is cut for securing head to wooden staff. From Fort Anderson. Length, 7 inches; bone head, 4 inches. British America, 1867. 5,818. Collected by Robert Macfarlane.

HARPOON-SHAFT.

Head made of walrus ivory, carved to represent an animal's head, and ornamented with incised circles and lines; wooden socket in animal's mouth to receive shank; head driven into white cedar shaft and secured by serving of stout twisted sinew. Length: staff, 48 inches; head, 9 inches. Nunivak Island, Alaska, 1880. 43,750. Collected by E. W. Nelson. Used in beluga, walrus, and seal hunting.

ESKIMO HARPOON-HANDLE.

Handle, wood, tipped with bone; shank, bone, inserted in recessed head of tip and lashed to handle with hide; pole in two sections to fit case. Totai length, 76 inches. Cape Lisburne, Alaska. 46,177. Collected by Wm. H. Dall.

HARPOON-SHAFT, WITH THROWING-STICK ATTACHED.

Head made of ivory or bone, rudely carved; wooden socket in the end receives shank; head is driven into white cedar staff and secured by a serving of fine twisted sinew. Used in beluga, walrus, and seal hunting. Length of staff, 48½ inches; head, 5½ inches. Norton Sound, Alaska, 1874. 33,898. Collected by E. W. Nelson.

HARPOON-SHAFT.

Head made of walrus ivory, carved to represent an animal's head; wooden socket in its mouth to receive shank; head is bifurcated to receive white cedar shaft and secured by a serving of

HARPOON-SHAFT—Continued.

stout twisted sinew. Used in beluga, walrus, and seal hunting. Length of staff, 46 inches; head, 8½ inches. Magemut Eskimo, Nunivak Island, Alaska, 1874. 15,658. W. H. Dall.

HARPOON-SHAFT.

Head made of walrus ivory, carved to represent an animal, black beads for eyes, red and white beads for nostrils; wooden socket in animal's open mouth to receive shank; head is bifurcated to receive white cedar staff, which is secured by a serving of stout twisted sinew. Used in beluga, walrus, and seal hunting. Length: staff, 46¼ inches; head, 9¾ inches. Chulitmut, Alaska, 1879. 36,080. Collected by E. W. Nelson.

HARPOON-SHAFT.

Head made of walrus ivory, carved to represent an animal; wooden socket in its mouth to receive shank; head is bifurcated to receive white cedar shaft, and secured by a serving of stout twisted sinew. Used in beluga, walrus, and seal hunting. Length of staff, 46 inches; head, 7 inches. Lower Kuskoquim, Alaska, 1879. 36,081. Collected by E. W. Nelson.

HARPOON-SHAFT.

Head made of a curved piece of walrus ivory, ornamented with incised lines and circles; wooden socket in the end receives shank; head is bifurcated to receive white cedar staff, which is secured by a serving of stout twisted sinew. Length: staff, 46½ inches; head, 9 inches. Kushunuk, Alaska, 1879. 36,082. Collected by E. W. Nelson. Used in beluga, walrus, and seal hunting.

HARPOON-SHAFT.

Head made of walrus ivory, rudely carved; wooden socket in the end receives shank; head is driven into white cedar staff and secured by serving of fine twisted sinew. Length: staff, 45¾ inches; head, 7 inches. Cape Vancouver, Alaska, 1879. 36,083. Collected by E. W. Nelson. Used in beluga, walrus, and seal hunting.

HARPOON-SHAFT.

Head made of walrus ivory, carved to represent an animal, blue beads for eyes; wooden socket in the end receives shank; head is driven into white cedar staff, and secured by a serving of fine twisted sinew. Length: staff, 43¼ inches; head, 10¾ inches. Nunivak Island, Alaska, 1879. 43,748. Collected by E. W. Nelson. Used in beluga, walrus, and seal hunting.

HARPOON-SHAFT.

Head made of walrus ivory, carved to represent an animal; wooden socket in its mouth to receive shank; head is bifurcated to receive white cedar shaft, and secured by a seizing of stout twisted sinew. Length: staff, 43¾ inches; head, 8 inches. Nunivak Island, Alaska, 1880. 43,751. Collected by E. W. Nelson. Used in beluga, walrus, and seal hunting.

HARPOON-SHAFT.

Head made of walrus ivory, ornamented with incised lines; wooden socket in the end receives shank; head is bifurcated to receive white cedar staff, and secured by a serving of sinew and caribou hair. Length: staff, 44½ inches; head, 10½ inches. Nunivak Island, Alaska, 1880. 48,367. Collected by E. W. Nelson. Used in beluga, walrus, and seal hunting.

STAFF FOR SEAL SPEAR.

Slender pole, with two prongs on the forward end and a finger-rest at the butt; spears wanting. Used to kill seal. Length, 15 feet. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,670. JamesG. Swan.

PHOTOGRAPHS AND DRAWINGS ILLUSTRATIVE OF THE USE OF SPEARS AND HARPOONS.

PORPOISE FISHING.

Photographs of Passamaquoddy Indians in birch-bark canoe in the act of spearing a porpoise after it has been shot with buck-shot fired from a common muzzle-loading shot-gun. Porpoises sink very soon after being shot, and the Indians must be quick in their movements to secure them with the spear. Size, 8 by 10 inches. Pleasant Point, near Eastport, Me., 1882. (206) 1,904. U. S. Fish Commission.

PORPOISE FISHING.

An enlarged photograph of Passamaquoddy Indians in birch-bark canoe in the act of spearing a porpoise after it has been shot with buck-shot fired from a common muzzle loading shot-gun. Porpoises sink very soon after being shot, and the Indians must be very quick in their movements to secure them with the spear. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. (206) 1,904. Pleasant Point, near Eastport, Me., 1882. U. S. Fish Commission.

TERRAPIN SPEARING.

An India-ink drawing, showing North Carolina negroes wading about in shoal water in search of terrapin, which they secure by

TERRAPIN SPEARING—Continued.

means of a crude one-pointed spear armed with a metal tip. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

INDIANS SPEARING FISH.

A crayon sketch showing a birch-bark canoe with two Indians engaged in catching fish. One Indian sits in the stern paddling the boat, while the other stands in the bow ready to spear the fish. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

ESKIMO SEAL HUNTING.

An India-ink sketch showing an Alaskan Eskimo dressed in his fur suit and provided with a harpoon creeping up to a seal on the ice. The costume of the Eskimo as he lies stretched out upon the ice causes him to somewhat resemble a seal in appearance, and by the use of a scratcher made out of seal's claws he makes a noise which frequently draws the seal near enough to him to enable him to strike it with a harpoon. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott, artist.

9. TANGLES.

TANGLES.

The tangles are employed by naturalists for the purpose of gathering small spiny animals, such as sea-urchins and star-fishes, from the bottom at considerable depths. They adhere to the fibers of the spun-yarn in great numbers. It has been thought that this instrument might advantageously be employed in freeing oyster-beds from their worst enemies, the star-fish. (See apparatus for deep-sea research.)

B.—APPARATUS OF INDIRECT APPLICATION.

III.—MISSILES.

**Simple missiles (those propelled by the unaided arm).*

10. Hurled spears.

darts and lances.

(See under spears, above enumerated, many of which may be used as missiles.)

***Centrifugal missiles.—(Propelling power augmented by an artificial crease of the length of the arm.)*

11. Missiles propelled by throwing-sticks.

spears and throwing-sticks.

Throwing-stick.

Wood, elaborately carved. A groove in the upper surface, ending against a small bone or ivory near smaller end, receives butt of spear. A small hole near the larger end receives the tip of the forefinger; the second finger rests against a pin on one side and the thumb in a slot on the other side. Used to increase leverage of arm when throwing harpoons, spears, &c. Length, $18\frac{3}{4}$ inches; width, $2\frac{1}{2}$ inches. Alaska, 1857. 2,523. U. S. Pacific Exploring Expedition, Commodore John Rodgers, U. S. N., commanding.

Throwing-stick.

Wood, rudely carved. A groove in the upper surface, ending against a small shoulder of bone or ivory near small end, receives butt of spear. A small hole near the large end receives tip of forefinger; the second finger rests against a pin on one side and the thumb in a slot on the other side. Used to increase leverage of arm when hurling harpoons, spears, &c. Length, $19\frac{1}{2}$ inches; breadth, $3\frac{1}{4}$ inches. Nunivak Island, Alaska, 1873. 16,242. W. H. Dall.

Throwing-stick.

A stick of wood, with a groove in upper surface, ending against a small strip of ivory nailed across the groove; on the side are two ivory pegs. Used to give leverage to arm in throwing harpoons, &c. The stick is grasped by the larger end, the

THROWING-STICK—Continued.

forefinger placed against it, the thumb around it, and two fingers over the pegs. The butt of the spear rests in the groove. Length, 1 foot 6 inches; width, 2 inches. Alaska, 1878. 33,914. Collected by E. W. Nelson.

THROWING-STICK.

Wood, rudely carved; a groove in the upper surface, ending against a small shoulder of bone or ivory at smaller end, receives butt of shaft. A small hole near the larger end receives the tip of the forefinger; the second finger rests against a pin on one side, and the thumb in a slot on the other side. Length, 21 inches; breadth, $2\frac{3}{4}$ inches. Norton Bay, Alaska, 1881. 48,142. Collected by E. W. Nelson. Used to add force to the blow of the harpoon by increasing leverage of arm.

THROWING-STICK.

Wood, grooved on one side; shoulder of ivory, against which the butt of the harpoon-shaft rests, rigidly fastened at the rear end of the groove; two ivory pegs are permanently fastened on one side at the rear end to strengthen the grip. Used by natives for hurling the harpoon in the capture of the beluga. Length, 18 inches. Bristol Bay, Alaska, 1882. 72,398. Collected by Charles L. McKay.

THROWING-STICK.

Wood, rudely carved; a groove in the upper surface, ending against a small shoulder of bone or ivory at smaller end, receives butt of spear. A small hole near the larger end receives the tip of the fore-finger; the second finger rests against a pin on one side, and the thumb in a slot on the other side. Length, $18\frac{1}{2}$ inches; breadth, 3 inches. Tshernoburo Island, Cook's Inlet, Alaska, 1882. 72,519. Collected by Wm. J. Fisher. Used to increase leverage of arm when hurling harpoons, spears, &c.

BELUGA HARPOON OR WHALING-STICK.

A light stick, $\frac{1}{2}$ inch in diameter, with walrus-ivory tip carved in the shape of the head of an animal; a wooden plug is inserted in the mouth, and recessed for the insertion of the neck or shank; head, bone, tipped with slate. When the beluga is struck the head becomes detached from the shaft. Used in connection with the throwing-stick. Length, 5 feet. Bristol Bay, Alaska, 1882. 72,391. Collected by C. L. McKay.

BELUGA LANCE-BUTTS.

Two butts made of walrus ivory; wedge-shaped, so as to be conveniently driven into the end of the lance, and provided with

BELUGA LANCE-BUTTS—Continued.

shoulders, by means of which they are seized and lashed. Length, $3\frac{3}{4}$ inches. 72,403. Length, 4 inches. 72,402. Bristol Bay, Alaska, 1882. C. L. McKay.

BELUGA HARPOON-SHAFT.

Light, wooden stick, $\frac{1}{2}$ inch in diameter, tipped with walrus ivory, carved in shape of a head of an animal. Harpoon wanting. Length, 4 feet $5\frac{1}{2}$ inches. Bristol Bay, Alaska, 1882. 72,392. Collected by Charles L. McKay. Used by natives, in connection with the accompanying throwing-stick (72,398), for the capture of the beluga.

BELUGA HARPOON-SHAFT.

Wood, $\frac{1}{2}$ inch in diameter, with ornamental head carved in walrus ivory. Harpoon wanting. Length, 4 feet 4 inches. Alaska. 72,393. Collected by C. L. McKay. Used by natives, in connection with the accompanying throwing-stick (72,398), in the capture of the beluga.

BIRD-SPEAR AND THROWING-STICK.

Pole, wood; iron spear barbed, inserted in tip; brass ferrule; three diverging bone barbs with one "beard" each, lashed to central part of handle. Throwing-stick, an instrument held in the right hand and used to hurl the spear; wood, slotted on one side for the reception of the handle of spear; one hole for index finger, and notches for thumb and fingers. Length of spear, 55 inches; of stick, 21 inches. Arctic America. 10,267. Smithsonian Institution.

BIRD-SPEAR.

Pole, wood; butt tipped with ivory; three branching barbs with two notches each, ivory, lashed to handle in center; two iron spears with one barb each inserted in tip of pole; tip of pole served with strips of baleen. Old; has been used. Length, 66 inches. Eskimo, Greenland. 19,516. Collected by George Y. Nickerson.

BIRD-SPEAR.

Long, smooth, ivory tip, slightly curved; cedar shaft; three converging ivory barbs, serrated on inner edges, are lashed to shaft 17 inches from butt. Length, 59 inches. Saint Michael's, Norton Sound, Alaska, 1876. 29,853. Collected by Lucien M. Turner.

BIRD-SPEAR (Nu-i-n'et).

Tip made of a heavy curved piece of walrus ivory, sharp-pointed and deeply serrated on one edge; long, cedar shaft; three di-

BIRD-SPEAR—Continued.

verging ivory barbs, serrated on outer edge, are lashed to shaft 7 inches from butt. Length, 55½ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,851. Collected by E. W. Nelson.

BIRD-SPEAR.

Three long, converging, ivory barbs, serrated on inner edges, lashed to end of cedar shaft by serving of twisted sinew. Length, 55 inches. Collected by E. W. Nelson. Nunivak Island, Alaska, 1880. 43,745.

BIRD-SPEAR.

Four long, diverging, ivory barbs, serrated on inner edges, lashed to the end of long cedar shaft by serving of twisted sinew. Length, 57¼ inches. Nunivak Island, Alaska, 1880. 48,356. Collected by E. W. Nelson.

BIRD-SPEAR.

Pole, wood, two pieces, scarfed and served with seal sinew; single spear at tip, serrated in three places on each side, seized in wedge-shaped scarf at tip with seal sinew; three bone barbs 8¾ inches long, each with four notches, seized to pole 45 inches from the tip with seal sinew. Length, 69 inches. Ooglaamie, Alaska, 1882. 72,830. Collected by Lieut. P. H. Ray, U. S. A.

BIRD-SPEAR.

Shaft, wood, in two sections, scarfed near tip, and served with seal sinew; butt of pole served with baleen; two bone barbs, with four notches, each on the inside, lashed to pole, about 42 inches from tip, with seal sinew. Length, 69¼ inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,832. Collected by Lieut. P. H. Ray, U. S. A.

GOOSE-SPEAR.

Long, round, iron tip in long cedar shaft; three diverging ivory barbs, serrated on inner edge, lashed to shaft 16½ inches from butt. Length, 57¼ inches. Saint Michael's, Norton Sound, Alaska, 1878. 33,878. Collected by E. W. Nelson.

****Missiles propelled by a spring.*—(*Spring consisting of bent rod.*)

12. BOWS AND ARROWS.

BOWS AND HARPOON-ARROWS USED IN FISHING.

BOW.

Spruce (?); semi-oval; string, a strip of deer-skin. Length, 51 inches; width, 1¾ inches. Bella Bella, British Columbia, 1876. 20,912. Collected by James G. Swan. Accompanied by three

Bow—Continued.

arrows; light cedar shafts with round bone heads; small, detachable, barbed tips—one of copper, two of bone—through which are rove the lines made of fine sennit, braided of sinew.

FISHING-BOWS.

Whalebone spreaders, 19 inches long, in shape of triangle; two snelled hooks; cone-shape lead sinker. Philadelphia, Pa., 1876. 25,667. Gift of Wm. M. Young. Used in the capture of catfish and other river species.

Bow.

Spruce; the ends are broad and thin, tapering to a point at their outer extremities, and to a nearly square shoulder at the middle of the bow; wrapped with strong twisted sinew. Length, 56½ inches. Bristol Bay, Alaska, 1882. 72,411. Collected by Charles L. McKay.

Bow.

Made of an elliptical piece of spruce, wrapped and strengthened with strong sinew. Length, 43 inches; width, 1½ inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,771. Lieut. P. H. Ray, U. S. A.

QUIVER.

Made of sealskin. Length, 28¾ inches; width, 6 inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,788. Collected by Lieut. P. H. Ray, U. S. A.

DEER ARROW.

Long, pointed, ivory tip, serrated on one edge; cedar staff; head and feathers secured by seizing of sinew. Length, 32 inches. Big Lake, Alaska, 1879. 36,176. Collected by E. W. Nelson.

DEER AND BEAR ARROW.

Long, stout, sharp-pointed, ivory tip, serrated on one edge, driven into cedar shaft; tip and feathers secured by serving of twine. Length, 36 inches. Rasboinsky, Lower Yukon River, Alaska, 1880. 49,043. Collected by E. W. Nelson.

BOW AND SIX ARROWS.

Bow made of a broad thin piece of spruce wood, with bark on inner side, served in two places with thin strips of fiber. Arrows have tips of iron and ivory, variously shaped, driven into light cedar shafts, tips and feathers being secured by a seizing of fiber paid with gum. Made by Indians. Bow: length, 35 inches; width, 1⅜ inches; arrows, 25¾ to 32½ inches. Northwest coast of America, 1841. 2,751. U. S. Exploring Expedition, Capt. Charles Wilkes, U. S. N., commanding.

BOW AND FIVE ARROWS.

Bow made of a broad, thin piece of spruce, with bark on inner side, served for a short distance with thin strips of fiber. Made by Indians. The arrows have variously-shaped tips, some with double points, some barbed; all the heads are driven into light cedar shafts, the heads and feathers being secured with a seizing of fiber secured by gum. Length of bow, 35 inches; width, $1\frac{1}{2}$ inches; arrows, 26 to 32 inches. N. W. coast of America, 1841. 2,754. U. S. Exploring Expedition, Capt. Charles Wilkes, U. S. N., commanding.

ESKIMO HUNTING-CASE, BOWS, AND ARROWS.

Case, deer-skin; one bow has end pieces made of the ribs of the deer and center-piece made of walrus tusk; the other bow made of ribs of deer and wood; thongs, sinews of the deer. Bows and case have been used; arrows new. Length of case, $34\frac{1}{4}$ inches. New Bedford, Mass., 1882. 68,127. U. S. Fish Commission. Eskimo, Hudson Bay. Used by some of the tribes in hunting deer, walrus, musk-oxen, seals, bears, partridges, &c. Obtained from crew of whaling-brig George and Mary.

BOW AND ARROWS.

Bow made of yew (*Taxus brevifolia*). Arrows brass-tipped and feathered. Center of bow served with common white wrapping twine. Length of bow, 43 inches. Makah Indians, Cape Flattery, 1883. 72,655. James G. Swan. Used by natives for killing both fish and birds.

BOW AND ARROWS.

Bow made of yew (*Taxus brevifolia*). Arrows tipped with steel; one with two points. Center of bow has hair from head of a young squaw—a superstition that the bow will be lucky—wrapped with slips of bark. Length of bow, 40 inches. Makah Indians, Cape Flattery, Washington Territory, 1882. 72,656. James G. Swan. Used by natives to kill both fish and birds.

QUIVER AND ARROWS.

From St. Lawrence Island, Bering Strait. Made by Eskimo. St. Lawrence Island, 1880. Collected by E. W. Nelson.

FISH-ARROWS (2).

Detachable tips, made of short iron points, with wooden barbs lashed together with seizing made of cedar roots, fit over the ends of light wooden staves. The line, made of twisted sinew or gut, is fastened to tips. Made by Makah Indians. Length, $39\frac{1}{2}$ inches. Cape Flattery, Washington Territory, 1862. 650. George Gibbs.

FISH-ARROWS (6).

Heads of barbed ivory or iron, driven into light cedar shafts. Heads and feathers secured by seizing of fine sinew. Used by Eskimo of Arctic coast of North America. Length: shafts, $21\frac{3}{4}$ to $24\frac{1}{2}$ inches; heads, $3\frac{1}{2}$ to 7 inches. Anderson River district, 1863. 1,106. Robert Macfarlane.

ARROWS FOR HUNTING AND FISHING (9).

Bone or ivory heads—two blunt, quadrilobate, having barbed ivory or iron tips. The heads are driven into light cedar shafts; heads and feathers secured by seizing of fine sinew. Used by Eskimo of Arctic coast of North America. Length of shaft, $21\frac{1}{2}$ to 26 inches; heads, $2\frac{1}{2}$ to $6\frac{1}{2}$ inches. Mackenzie River district, 1863. 1,965. B. R. Ross.

FISH-ARROWS (10).

Barbed ivory heads; one blunt, quadrilobate, driven into light cedar shafts; heads and feathers secured by seizings of fine sinew. Used by Eskimo of Arctic coast of North America. Length: shafts, $20\frac{3}{4}$ to $25\frac{3}{4}$ inches; heads, 2 to 7 inches. Mackenzie River district, 1863. 1,966. B. R. Ross.

FISH-ARROWS (10).

Thin, lozenge-shaped iron heads, beveled edges, serrated on inner edges, driven into light cedar shafts. Heads and feathers secured by seizing of fine sinew. Used by Eskimo of Arctic coast of North America. Length: shafts, 25 inches; heads, 4 to 5 inches. Mackenzie River district, 1873. 1,967. B. R. Ross.

ARROW.

Shaft of cedar, $\frac{3}{8}$ inch in diameter, with butt feathered, and with carved barbed bone head attached to outer end in a slot, in the end of which is lashed a clipped flint arrow-head 2 inches long. Length, 2 feet 5 inches; bone head, 6 inches. Alaska, 1867. 6,609. Collected by Hon. George McKeim.

FISH-ARROWS (4).

Long, round, ivory or bone heads, with detachable barbed copper tips through which the line is rove. Staves of white cedar; feathers secured by serving of fine sinew. Made by Yakutst Indians. Length, including head, 33 to 35 inches. Port Mulgrave, Alaska, 1874. 16,406. William H. Dall.

ARROWS (3).

Shafts of cedar, $\frac{1}{2}$ inch in diameter, with butts feathered, and with carved, barbed bone heads in slots, in outer end of which are

ARROWS (3)—Continued.

lashed barbed metal arrow-heads 1½ inches long. Magemut Indians, Nunivak Island. Length, 2 feet 7 inches; bone heads, 6½ inches. Alaska, 1874. 16,413. Collected by William H. Dall.

ARROWS (2).

Shafts of cedar, ½ inch in diameter, with butts feathered, and with carved, barbed bone heads in slots, in outer ends of which are lashed barbed metal arrow-heads 1½ inches long. Magemut Indians, Nunivak Island. Length, 2 feet 8 inches; bone heads, 6½ inches. Alaska, 1874. 16,414. Collected by William H. Dall.

ARROW.

Shaft of cedar, ½ inch in diameter, with butt feathered, and with carved, barbed bone head in slot, in outer end of which is lashed a barbed metal arrow-head. Magemut Indians, Nunivak Island. Length, 2 feet 6 inches; bone head, 7 inches. Alaska, 1874. 16,415. Collected by William H. Dall.

FISH ARROW OR DART.

Head made of a curved piece of walrus ivory, with double barbs; staff, white cedar, unfeathered. Length: staff, 34 inches; head, 5 inches. Bella Bella, British Columbia, 1876. 20,690. James G. Swan.

FISH ARROWS (7).

Six specimens with long, bone or ivory tips, sharp-pointed, notched on one edge; one specimen with long, double-edged, rounding, flint head; cedar shafts; heads and feathers secured by seizing of fine sinew. Length, 29 to 31 inches. Kavianagmut, St. Michael's, Norton Sound, Alaska, 1877. 33,822. Collected by E. W. Nelson.

ARROWS (5).

Long, narrow, sharp-pointed, ivory heads, barbed on one edge, driven into light cedar shafts. Heads and feathers secured by serving of fine sinew. Length, 20⅝ to 22½ inches. Kavianagmut, Norton Sound, Alaska, 1878. 33,825. Collected by E. W. Nelson.

ARROWS (7).

Long, triangular, ivory points, irregularly serrated; cedar shafts; feathers secured by seizing of fine sinew. Used for killing ducks, muskrats, &c. Length, 28 to 36 inches. St. Michael's, Norton Sound, 1878. 33,829. Collected by E. W. Nelson.

ARROWS (7).

Small, sharp-pointed, ivory heads, with from one to three barbs on one edge, driven into cedar shafts. Heads and feathers secured by seizing of sinew. Length, 23¾ to 28¾ inches. St. Michael's, Norton Sound, Alaska, 1878. 33,845. Collected by E. W. Nelson.

FISH-ARROWS (9).

Heavy, bone or ivory heads with detachable, small barbed bone tips, secured by becket of fine twisted sinew; staves of white cedar; feathers secured by serving of fine sinew. Length, from 29 to 35 inches. Alaska, 1879. 36,142, 36,145, 36,167, 36,168, 36,169, 36,150, 36,151, 36,152, 36,153. Collected by E. W. Nelson.

FISH-ARROW.

Three diverging ivory barbs, lashed to end of cedar shaft; feathers secured by seizing of fine sinew. Length, 35½ inches. Kushunuk, Alaska, 1879. 36,162. Collected by E. W. Nelson.

FISH-ARROWS.

Three diverging, ivory barbs, serrated on inner edges, lashed to end of cedar shaft; feathers secured by seizing of fine sinew. Length, 37½ inches. Chatetmut, Alaska, 1879. 36,170. Collected by E. W. Nelson.

ARROWS (10).

Long, ivory heads, sharp-pointed, three-sided, with from one to three notches on one edge; cedar shafts; feathers are caught in deep incision at forward end and secured by seizing of fine sinew at butt. Made by Mahlemuts, of Nunivak Island, formerly of Norton Sound. Length, 27¾ to 28¾ inches. Nunivak Island, Alaska, 1880. 43,682 to 43,692. Collected by E. W. Nelson.

FISH AND BIRD ARROW.

Two converging, ivory barbs, serrated on outer edges, lashed to end of cedar shaft; feathers secured by seizing of fine sinew. Length, 33 inches. Rasboinsky, Lower Yukon River, Alaska, 1880. 49,039. Collected by E. W. Nelson.

ARROW.

Small, thin iron tip, with single barb, in long, ivory shank; cedar shaft. Length, 29½ inches. Saint Lawrence Island, Alaska. 1880. 63,580. Collected by E. W. Nelson.

ARROW.

Flat, narrow, sharp-edged, ivory head, cedar shaft. Head and feathers secured by serving of fine sinew. Length, 29½ inches.

ARROW—Continued.

Saint Lawrence Island, Alaska, 1880. 63,581. Collected by E. W. Nelson.

ARROW.

Small, thin iron tip in long, ivory shank; cedar shaft; shank and feathers secured by seizing of fine sinew. Length, 29¾ inches. Saint Lawrence Island, Alaska, 1880. 63,583. Collected by E. W. Nelson.

ARROW.

Three-edged, sharp-pointed, ivory head in cedar shaft, secured by seizing of fine sinew. Length, 35½ inches. Saint Lawrence Island, Alaska, 1880. 63,584. Collected by E. W. Nelson.

ARROW.

Lanceolate, iron tip, barbed at base, with long shank that is driven into cedar shaft; tip and feathers secured by seizing of fine sinew. Length, 27½ inches. Saint Lawrence Island, Alaska, 1880. 63,585. Collected by E. W. Nelson.

ARROWS (2).

Long, round, ivory heads, with sockets to receive adjustable barbed ivory tip, to which is fastened the line made of twisted sinew; cedar shaft; head and feathers secured by seizing of fine sinew. Length, 31 inches. Bristol Bay, Alaska, 1882. 72,412. Collected by Charles L. McKay.

ARROW.

Three converging, ivory barbs, serrated on inner edges, lashed to end of cedar shaft. Feathers secured by seizing of fine sinew. Length, 35 inches. Bristol Bay, Alaska, 1882. 72,413. Collected by Charles L. McKay.

ARROWS (17).

Iron and ivory or bone heads, in a variety of shapes, driven into light cedar shafts; heads and feathers secured by seizing of fine sinew. Length, 23 to 31 inches. Ooglaamie, Point Barrow, Alaska, 1881–'82. 72,754 to 72,770. Lieut. P. H. Ray, U. S. A.

ARROWS (16).

Ivory, bone, flint, and copper heads in a variety of shapes, driven into light cedar shafts; heads and feathers secured by seizing of fine sinew. Length, 27 to 30 inches. Ooglaamie, Point Barrow, Alaska, 1881–'82. 72,772 to 72,787. Lieut. P. H. Ray, U. S. A.

*****Missiles propelled by explosives.*

13. GUNS.

WHALING GUNS, SHOULDER GUNS, SWIVEL GUNS.

(See section E, "The Whale Fishery and its Appliances.")

IV.—BAITED HOOKS, ANGLING TACKLE, &c.

14. HOOKS WITH MOVABLE LINES. HAND TACKLE.

TACKLE FOR SURFACE FISHING.

ANGLER'S TACKLE FOR FLY-FISHING.

(Salmon tackle, trout tackle, black-bass tackle, shad tackle.)

TROLLING TACKLE.

(Trolling tackle, whiffing-tackle, drailing-tackle. The parts of these gears may be seen in their proper places, with hooks, lines, &c.)

PAINTINGS AND PHOTOGRAPHS ILLUSTRATIVE OF ANGLING.

Paintings of game fishes.

GAME FISHES OF THE UNITED STATES:

A series of 20 magnificent paintings of fishes and scenery, by S. A. Kilbourne, with text by G. Brown Goode, assistant director United States National Museum and assistant in the United States Fish Commission; ten parts in wrappers, not stitched, large folio, 1879–1881.

The plates are the exact reproductions of the water-color paintings of S. A. Kilbourne, the studies for which were made from life, by the brook and on the shore. The details of form and structure are preserved with scientific accuracy, while color and life-action are shown with excellent effect. The work has been completed in ten parts, each part containing two plates, size 20½ by 14 inches, mounted on heavy board, 28 by 22 inches: and the letter-press printed on rich-toned calendered paper. Wood-engravings are added.

"Mr. Kilbourne's paintings will open up a new world of delight to many who have never dreamed of the loveliness of the denizens of our own streams and bays. * * * Game fishes are those which, by reason of their cunning, courage, strength, beauty, and the sapidity of their flesh, are sought for by those who angle for sport with delicate fishing tackle. * * * In preparing the following essays my endeavor has been to give a concise account of habits and geographical distribution. Descriptions would be superfluous, for Mr. Kilbourne has combined in his paintings artistic truth of coloring and scientific accuracy in the delineation of form. Fish-culture is frequently

GAME FISHES OF THE UNITED STATES—Continued.

referred to, since its results are of great interest to the zoologist, the angler, and the public at large." (From the preface of Mr. Goode.)

Contents: Part I, the Atlantic Salmon; the Eastern Red-speckled Trout. Part II, the Spanish Mackerel; the Black Basses. Part III, the Striped Bass; the Red Snapper. Part IV, the Bluefish; the Yellow Perch. Part V, the Mackerel; the Weakfish or Southern Sea Trout. Part VI, the Pompano and its allies; the Sea Bass or Southern Black-fish. Part VII, the King-fish and the Whiting; the Sheepshead and the Scuppaug. Part VIII, the Namaycush or Lake Trout; the Bonito and the Tunnies. Part IX, the Red-fish; the Grayling. Part X, the California Salmon; the Muskellunge, Pike, and Pickerel.

Exhibited by Charles Scribner's Sons, New York City.

Charles Scribner's Sons also exhibited a map showing by means of colored lines the geographical distribution of the game fishes of eastern North America extensively sought by anglers, compiled from sketches by G. Brown Goode; and 18 plates of the "Game Fishes" in 24 by 30 frames as follows:

1. A sea-bass or Southern blackfish (*Serranus atrarius*) lying upon the grass, with the ocean shore in the background, and fishermen on the beach overhauling their nets and putting them on reels to dry.
2. A striped bass (*Roccus saxatilis*), fresh from the water, with a portion of the shore and sea in the background, showing the breakers and the hull of an old vessel stranded upon the beach.
3. A bluefish (*Pomatomus saltatrix*) lying upon the bank, with the ocean in the background and vessels engaged in trolling.
4. A yellow perch (*Perca americana*) being drawn from the river by means of an angler's fly which it has just taken.
5. Brook trout (*Salvelinus fontinalis*) hooked by an angler's fly in the lower jaw and jumping from the water in frantic efforts to free itself. A portion of a wild river-bank, with rapids in the distance.
6. A grayling (*Thymallus tricolor*) lying on the moss-covered roots of an old pine tree, with a long strip of a Michigan grayling stream, lined with pine forests, in the background.
7. A namaycush or lake trout (*Salvelinus namaycush*) fresh from the water, lying on a moss-covered rock.
8. A California salmon (*Oncorhynchus chouicha*) with the rod, reel, and fly on which it was taken lying by its side, and the stream, with rapids, in the background.
9. An Atlantic salmon (*Salmo salar*) struggling at the surface of the water with an angler's hook in its upper jaw; a portion of a river-bank in the background.

GAME FISHES OF THE UNITED STATES—Continued.

10. A mackerel (*Scomber scombrus*) lying on a rock, with a long strip of beach showing breakers, and the ocean in the background. In the distance are a few sail of vessels engaged in mackerel fishing.
11. A squeteague or weakfish (*Cynoscion regalis*) on a moss-covered ledge, with a distant view of the water from which it was taken.
12. A Spanish mackerel (*Scomberomorus maculatus*) sporting at the surface of the sea, with a school of others a little less distinct near by. The picture is supposed to show the habit of the fish in schooling at the surface and jumping from the water in long graceful leaps.
13. A Southern pompano (*Trachynotus carolinus*) in its native element, just about to take a hook that has been baited with a live shrimp. Another fish of the same species swimming about at a little distance from the first.
14. A red snapper (*Lutjanus blackfordii*) among the branching corals in the bottom of the sea, in the act of taking a baited hook, which hangs suspended in the water.
15. A red drum red-fish (*Sciænops ocellatus*) fresh from the surf, which is represented in the background.
16. A striped bonito (*Sarda pelamys*) lying near an old boat, from which it has been taken.
17. A sheepshead (*Diplodus probatocephalus*) feeding upon scallops, which have fastened themselves to the vegetation at the bottom of the sea. The view shows fragments of scallop shells which have been broken and dropped to the bottom by the sheepshead.
18. Two king-fish (*Menticirrus nebulosus*) lying upon a log on the beach, with a strip of ocean and a vessel in the background.

Photographs of angling scenes.

STRIPED BASS ANGLING.

Photograph showing Newport anglers with their rods, reels, and gaffs, together with ten enormous bass, ranging from 36 to 58 pounds, which they have just taken. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 inch negative. Newport, R. I., 1880. U. S. Fish Commission.

SURF-TACKLE FOR THROWING AND HAULING.

DRAWINGS ILLUSTRATING THE METHOD OF USING SURF-TACKLE.

COD-LINE FISHING FROM BEACH.

An india-ink sketch of Aleuts standing on the beach in front of their settlement and throwing baited hooks into the water, which the fish quickly swallow, and are drawn out and killed

COD-LINE FISHING FROM BEACH—Continued.

with clubs. This is a common mode of fishing among the Eskimo and Indians. Size, 30 by 40 inches. Alaska, 1882. Henry W. Elliott.

BLUEFISH TACKLE.

BLUEFISH TROLLING-LINE.

White linen line; eel-skin squid. Newport, R. I. 24,808. Gift of J. M. K. Southwick. Used by Block Island fishermen in trolling for bluefish.

SKANEATELES TROLLING-LINE.

Tarred cotton line, hard-laid, 650 feet long. The baited hook represents a piece of pork cut round; to the end of this is attached a small strip from a sucker, which they call a flipper. A piece of lead pipe is used to extricate the hook when caught in a log or other obstruction when in motion. A short leader with sinker attached is used on this line for still fishing; the line is then kept bobbing, in from 40 to 70 feet of water, the boat being at anchor. Skaneateles, N. Y., 1883. 57,040–1. Collected by Reuben Wood. This gear is coiled in a cheese-box, and is rigged for use.

BLUEFISH TROLLING-LINES.

Blue cotton lines; cone-shaped lead sinkers; long, straight-shank ringed hooks, covered with colored cotton cloth. Block Island, R. I., 1875. 24,802–5. Gift of J. M. K. Southwick. Used by Block Island fishermen in trolling for bluefish.

BLUEFISH TROLLING-LINE.

Full rigged; 5-pound tarred cotton line wound on wooden stick; piano-wire ganging 9 inches long; one straight-shanked hook. Staten Island, N. Y., 1883. 57,576. Gift of Capt. F. M. Redman. Used by New York, New Jersey, and Southern New England fishermen, but especially by the New York market fishermen.

BLUEFISH TROLLING-LINE.

Blue cotton line, leather strap, red cotton squid, central-draught hook. Provincetown, Mass., 1875. 25,711. Gift of Coleman Cook. This style of line and squid is peculiar to Provincetown.

TACKLE FOR FISHING BELOW THE SURFACE.

SHORT HAND-GEAR.

THROW-LINE WITH MINNOW HOOKS.

Long line, probably of *Asclepias* fiber, with gangings 3 to 4 inches long, 7 to 9 inches apart. Throw-stick 2 feet long. Hooks of

THROW-LINE WITH MINNOW HOOKS—Continued.

wood and bone. Used by Pai-Ute (Nyuma) Indians. Pyramid Lake, Nevada, 1876. 19,047. Collected by Stephen Powers.

FISHING TACKLE.

"Otter" with line and flies attached. The tackle consists of a flat board, 1 inch thick, cut in boat shape, 2 feet long and 1 foot wide; main line of linen wound on a thin board; gangings of braided silk; gut snells; trout hooks trimmed with feathers. Lake City, Minn., 1877. Gift of William Morris. 29,293. Used in lake and river fishing in Western States.

DEEP-SEA HAND-GEAR.

(Hand-lines used by Eskimo and Indians.)

HALIBUT FISHING TACKLE (3).

Lines made of the stem of the giant kelp (*Nereocystis lutkeana*), the lower portion of which is solid and cylindrical, and about a fourth of an inch in diameter. Hooks made of splints from hemlock knots bent in form somewhat resembling an ox-bow. Barbs made of bone are lashed to lower side with slips of spruce or strips of bark of white cherry. Made by Clyoquet and Makah Indians. Puget Sound, 1863–1876. 1,140; 26,819; 26,822. Collected by James G. Swan.

HALIBUT LINE AND HOOK.

Kelp (*Nereocystis*) made in lengths of about 30 feet and knotted together as required. Hook made of splints from hemlock knot; bone barb. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,642. James G. Swan. The kelp is obtained during summer in 15 or 20 fathoms of water on the halibut banks off Cape Flattery, soaked in running fresh water, stretched on the beach till partly dry, and finally smoked and "cured." When dry the lines are brittle; when wet, exceedingly tough and durable, and make excellent fishing-lines.

FISH-LINE AND HALIBUT HOOKS (2).

Line made of kelp (*Nereocystis lutkeana*). Hooks made of wood, in two pieces, lashed together in a point at lower end, with iron barbs. One shank is carved to represent a fish, the other a man's arm and hand. Made by Scowallis tribe of Haidah Indians. Prince of Wales Archipelago, Alaska, 1868. 6,561. Collected by Dr. T. T. Minor.

FISH-HOOKS AND LINE-SPREADER.

Hooks made of bone, with curved stock and straight shank; no barb; spreaders a small round piece of wood; lines and gangings made of seal-skin. Made by Thlinket Indians. Length: Hooks, 7¼ to 9 inches; spreader, 11 to 17 inches. Sitka, Alaska, 1874. 16,311; 16,312. Collected by William H. Dall.

FISHING TACKLE (6).

Short wooden sticks, notched at the ends for reeling line; lines of sinew, seal-skin, whalebone, or vegetable fiber; hooks iron or copper barbs passed through bone or ivory shanks, some with gangings and sinkers, some without. Alaska, 1878 to 1881. 33,725, 33,815, 33,852, 33,899, 33,900, 56,544. Used in catching small fish, such as tomcod, whitefish, pickerel, wolf-fish, &c.

FISHING TACKLE (8).

Short wooden sticks, notched at the ends for reeling line; line made of split quills, twisted sinew, whalebone, or seal-skin; hooks, curved brass or iron, barbless points passed through bone or ivory shanks; some have stone or ivory sinkers and gangings of same material as line. Used in catching smaller fish, such as tomcod, whitefish, blackfish, &c. Alaska, 1878 to 1881. 33,811; 33,812; 33,814; 33,816; 33,817; 33,853; 33,915; 53,543.

FISHING LINES.

Two fishing-lines, kelp; floats, sea-lion gut; gorge-hooks, bone. Brittle when dry, tough and pliable when wet. Used in the capture of small fish. Makah Indians, Cape Flattery, Washington Territory, 1882. 72,643–4. James G. Swan. Indian names: Lines, "Sar-dat-tlh"; float, "koo-yu"; hook, "kodo-datie." The entire apparatus, "Ho-kwaksh-to-kuptl," or small fish line.

FISHING-LINES (2).

Made of kelp, to which are fastened small gorge-hooks by twisted cord ganging. The hooks are made of a piece of bone, sharp as a needle at both ends and tied in the middle. Small bladder buoys are attached to upper portions of line, several of which are set at one time, and when the fish is hooked it pulls the bladder but cannot draw it under water. Used for small fish like perch or rockfish. Made by Makah Indians. Neah Bay, Washington Territory, 1883. 72,643–4 (*a*). James G. Swan.

FISHING-LINE.

Kelp line, with sharp-pointed straight wire toggles, or gorge-hooks. These hooks are very effective in securing the fish, and are preferred to the common form when fishing on "catchy" bot-

FISHING-LINE—Continued.

toms, as they do not foul with the rocks. Makah Indians, Cape Flattery, Washington Territory. 72,645. James G. Swan.

FISHING-LINE.

Made of kelp, to which are fastened seven small gorge-hooks made of pieces of iron sharp at both ends, by a ganging of twisted sinew tied to middle. Neah Bay, Wash., 1883. 72,645 (*a*). Collected by James G. Swan. Made by Makah Indians, and preferred for fishing on a rocky bottom, as they will not foul like bent hooks.

(*Modern hand-line gear.*)

SHORE COD HAND-LINE.

Full rigged, ready for use. Wooden reel, with handle; 6-pound tarred cotton line, 25 fathoms long; Lothrop's improved 2-pound lead sinker, with brass tail-stock and bumper, and brass horse with swivel, and leather strap; tarred cotton snood, hemp ganging; one central-draught hook, No. 12, flatted. Gloucester, Mass., 1882. U. S. Fish Commission. 54,501. Used in the shore cod boat-fisheries in the vicinity of Cape Ann, Mass.

SHORE COD HAND-LINE.

Full-rigged, 8-pound tarred cotton line, 25 fathoms long, on wooden reel; 2-pound lead sinker, with brass ring, swivels and horse, and leather straps; blue cotton snoods; hemp ganging; one Kirby hook, No. 2, flatted. Rockport, Mass., 1882. U. S. Fish Commission. 57,583. Used by the shore boat fishermen of Cape Ann, Mass.

SHORE COD HAND-LINE GEAR.

Lothrop's 1-pound lead sinker, with leather strap, brass bumper, and horse with swivel; snood of 6-pound tarred cotton line partly served with twine; slot swivel at end, hemp gangings; two central-draught hooks, No. 13, flatted. Gloucester, Mass., 1880. U. S. Fish Commission. 39,187. Attached to from 25 to 75 fathoms of tarred cotton line, this gear is used in the shore cod boat fishery in the vicinity of Cape Ann, Mass.

SHORE COD HAND-LINE GEAR.

Lothrop's 1½-pound lead sinker, with leather strap, brass bumper, horse and swivel; snoods of 6-pound tarred cotton line partly served with twine; slot swivels at ends; hemp gangings; two central-draught hooks, No. 13, flatted. Gloucester, Mass., 1880. U. S. Fish Commission. 39,186. Attached to from 25 to 75 fathoms of tarred cotton line, this gear is used in the shore cod boat fishery in the vicinity of Cape Ann, Mass.

GEORGE'S COD HAND-LINE.

Full rigged, ready for use; 16-pound tarred cotton line, 75 fathoms long; 9-pound lead sinker with galvanized iron tail-stock; wooden horse, with brass swivel; sling-ding gear of tarred cotton line served with twine; brass spreader; snoods 5 feet long, of 12-pound tarred cotton line; slot swivels of brass; hemp gangings; two central-draught hooks, No. 10, flatted. Boston, Mass., 1876. 25,687.

GEORGE'S COD HAND-LINE.

Rigged for use; 16-pound tarred cotton line, on wooden reel; 9-pound lead sinker, with galvanized iron tail-stock; iron horse, with brass swivel at end; sling-ding gear, with iron spreader; snoods each 5 feet long, of 8-pound tarred cotton line, with slot swivels; tarred cotton gangings; two central draught hooks, No. 10, flatted. Gloucester, Mass., 1877. Made by Alexander McCurdy. 29,471. Used by Gloucester vessels in cod and halibut fishery on George's Bank.

GEORGE'S HAND-LINE GEAR.

Lothrop's 9-pound lead sinker, with galvanized iron tail-stock and brass bumper; wooden horse, with brass swivel; sling-ding gear of tarred cotton line, and galvanized iron spreader; tarred cotton snoods, with slot swivels; hemp gangings; two central-draught hooks, No. 10, flatted. Gloucester, Mass., 1880. U.S. Fish Commission. 39,182. Attached to 125 fathoms of line, this gear is used in the fishery for cod and halibut on George's Bank.

GEORGE'S COD HAND-LINE.

Full-rigged, ready for use, coiled in wooden tub made from a flour barrel; 16 pounds tarred cotton line, 125 fathoms long; Lothrop's improved 9-pound lead sinker with galvanized iron tail-stock, leather strap, brass bumper, and wooden horse, with brass swivel; sling-ding gear of tarred cotton line, and galvanized iron spreader: snoods of tarred cotton, with slot-swivels at ends; hemp gangings; two central-draught hooks, No. 10, flatted. Gloucester, Mass. 1882. U. S. Fish Commission. 54,499. Used by Gloucester vessels in fishing for cod and halibut on George's Bank.

COD HAND-LINE.

Style of 1812 to 1830. Cotton line; 5-pound lead sinker with leather straps; horse made of heavy line, horn swivel, short snoods, two straight-shank cod hooks seized to gangings 12 inches long. Provincetown, Mass. 1877. Gift of Capt. Lemuel Cook, 2d. 29,483. This hand-line was used by Captain Cook from 1812 to 1830 in the Bank and shore cod fisheries.

BANK AND SHORE COD HAND-LINE.

Full rigged, ready for use. Wooden reel with becket and swivel; 8-pound tarred cotton line, 50 fathoms long; Lothrop's improved 3-pound lead sinker with brass tail-stock, bumper, and horse with swivel; tarred cotton snoods, partly served with twine; slot swivels at ends, hemp gangings, two hooks, central-draught, No. 12, flatted. Gloucester, Mass., 1882. U. S. Fish Commission. 54,502. Used in the Western, Grand Bank, and shore cod hand-line fisheries.

BANK COD HAND-LINE.

Full rigged, ready for use. Wooden reel with becket and swivel; 12-pound tarred cotton line, 50 fathoms long; Lothrop's improved 4-pound lead sinker with brass tail-stock, bumper, and horse with swivel; snoods of tarred cotton partly served with twine, slot swivels at ends; hemp gangings; two central-draught hooks, No. 12, flatted. Gloucester, Mass., 1882. U. S. Fish Commission. 54,503. Used in the hand-line cod fisheries on Banquereau and Grand and Western Banks.

BANK COD HAND-LINE.

Full rigged, ready for use. Wooden reel with handle; 10-pound tarred cotton line, 25 fathoms long; 5-pound lead sinker; rope horse served with twine, brass swivel at end; snoods of 8-pound tarred cotton line partly served with twine; gangings of hemp; two central-draught hooks, No. 12, flatted. Centennial collection, 1876. Bradford & Anthony, Boston, Mass. 25,686. Used in varied lengths by many New England vessels in the Western and Grand Bank cod fishery.

BANK COD HAND-LINE.

About 15 fathoms of 10-pound tarred cotton line, on wooden reel, with handle; $3\frac{1}{2}$-pound lead sinker with strap and horse made of tarred cotton line served with twine; blue cotton snoods; hemp gangings; two Kirby hooks, Nos. 2 and 4, flatted. Gloucester, Mass., 1882. U. S. Fish Commission. 57,584. Used in cod fishery from dories on Banquereau, Grand, and Western Banks.

SHORE COD AND POLLOCK HAND-LINE.

Full rigged, ready for use. Blue cotton line 50 fathoms long, on wooden reel; 1 pound lead sinker with brass ring and swivel; leather strap; and brass horse with leather straps; blue cotton snood; hemp ganging; one central-draught hook, No. 14, flatted. Rockport, Mass., 1882. U. S. Fish Commission. 57,582. Used by the shore boat fishermen of Cape Ann in the capture of cod and pollock.

POLLOCK HAND-LINE.

Full rigged, ready for use. Wooden reel with handle; 6-pound tarred cotton line, 25 fathoms long; Lothrop's improved 1-pound lead sinker with brass tail-stock and bumper, and brass horse with swivel; tarred cotton snood; hemp ganging; one central-draught hook, No. 13, flatted. Gloucester, Mass., 1882. U. S. Fish Commission. 54,500. Used in shore fishery for pollock.

POLLOCK HAND-LINE.

Full rigged, ready for use. Blue cotton line No. 4, 25 fathoms long, on wooder reel; ½-pound lead sinker with leather straps; tarred cotton snoods, white cotton gangings; one hook, central-draught, No. 14, flatted. Rockport, Mass., 1882. 57,581. Used by the boat fishermen of Cape Ann in the capture of pollock.

POLLOCK HAND-LINE.

Rigged on wooden reel with handle; 6-pound tarred cotton line; 1-pound lead sinker with horse 12 inches long, of heavy tarred line served with twine and swivel at end; snood of blue cotton line; hemp ganging; one central-draught hook, No. 13, flatted. Centennial collection, 1876. Bradford & Anthony, Boston, Mass. 25,685. Used to some extent in off-shore fishery for pollock.

BIRD HAND-LINE.

Full-rigged; white cotton mackerel line on wooden reel; blue cotton ganging; one mackerel-hook. Gloucester, Mass., 1880. 55,415. U. S. Fish Commission. Used in Grand Bank cod-fishery in catching birds for bait.

SHEEPSHEAD GEAR.

White cotton ganging, double, served with thread; two straight-shank (I. P. large quarter) hooks, flatted. Saint Augustine, Fla., 1880. 54,701. Collected by R. E. Earll. Used by fishermen of Saint Augustine in the capture of sheepshead.

SEA-BASS GEAR.

White cotton ganging, double, served with thread; two Virginia hooks (3/0), flatted. Saint Augustine, Fla., 1880. 54,507. Collected by R. E. Earll.

SEA-BASS HAND-LINE.

Full rigged; 5-pound tarred cotton line on wooden reel; small lead sinker 2¾ inches long; snood 8 inches long, of double and twisted line; gangings 6 and 12 inches long; two central-draught hooks, No. 15, eyed. Staten Island, N. Y., 1883. 57,577. Gift

SEA-BASS HAND-LINE—Continued.

of Capt. F. M. Redmond. Used by the market fishermen of New York and Southern New England in the capture of sea-bass.

SEA-TROUT LINE.

Full rigged; white cotton line on wooden reel; two straight-shanked hooks on cotton gangings 9 inches long; lead sinker. Magnolia, Del., 1883. 57,563. Gift of M. S. Van Burkalow. Sea-trout are caught in large quantities along the shore with the common surf or haul seine during May and June, which is the spawning season. During July, August, and September these fish move off shore and are then taken with the hand-line.

SPOTTED-TROUT HAND-LINE GEAR.

Two spreaders made of small forked branches of tree; short gangings; three hooks, straight shanks, flatted; lead sinker attached by line 13 inches long to crotch of lower spreader. Wilmington, N. C., 1880. 57,579. Collected by R. E. Earll. Used in the capture of spotted trout, pig-fish, and other species.

BLACKFISH AND WHITING GEAR.

White cotton gangings (double) served with thread; two Kirby hooks, No. 8, flatted. Saint Augustine, Fla., 1880. 54,506. Collected by R. E. Earll. Used along the Florida coast for the capture of blackfish and whiting.

WHITING HAND LINE.

Full rigged, white cotton line; lead sinker in three pieces, acting as spreader; gangings 5½ inches long; three small-size Kirby hooks; one extra hook above the sinker. Charleston, S. C., 1880. 57,580. Collected by R. E. Earll. Used by the negroes of Charleston and vicinity in the capture of various marine species of fish.

FISHING-TACKLE.

Wooden rest; leaders, sinkers, and brass spreaders. U. S. Fish Commission. 25,563. Used for smelt fishing through the ice.

HAND-LINES.

Full rigged for pond fishing. Silk and cotton lines, wood and quill floats, small sinkers and hooks. Centennial collection, 1876. 25,665. Gift of William M. Young.

DRUM-FISH HAND-LINE.

White cotton line wound on circular block; two round, sliding sinkers; ganging served with thread; large, curved hook. Saint Augustine, Fla., 1880. 54,504. Collected by R. E. Earll. Used in the capture of drum-fish off the Florida coast.

PHOTOGRAPHSS, DRAWINGS, AND PAINTINGS ILLUSTRATIVE OF THE HAND-LINE FISHERIES.

POLLOCK HAND-LINING.

Photograph showing a fleet of vessels and boats engaged in pollock fishing off Cape Ann. A pinkey in the foreground has fishermen in the act of hauling fish on deck. Size, 8 by 10 inches. Massachusetts Bay, 1882. (277) 1,940. U. S. Fish Commission.

HAND-LINING ON GEORGE'S BANKS.

An India-ink sketch showing a portion of the deck of a Gloucester vessel with three of the crew engaged in catching cod with hand-lines. One man is unhooking a fish which he has just caught, a second is just hauling a large cod over the rail with a gaff, while the third is holding his line out for a bite. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

ESKIMO FISHING FOR HALIBUT.

An India-ink sketch showing a number or Eskimo in single bidarkas, engaged in fishing for halibut with hand-lines on the Alaskan coast. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

ESKIMO FISHING FOR HALIBUT.

An India-ink sketch of Eskimo in single and double kyaks engaged in catching halibut with hand-lines on the coast of Alaska. To prevent the kyaks from upsetting, two boats come together and steady themselves by means of the paddles which are stretched from one to the other and held firmly. A man in one boat holds the hand-line, and the one in the other holds a club ready to kill the halibut as soon as it is brought to the surface. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

BLUEFISH HAND-LINING.

An enlarged photograph showing group of bluefish fishermen on board their vessel, with apparatus and outfit ready for engaging in the fishery. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. New York Harbor, 1882. U. S. Fish Commission.

POLLOCK HAND-LINING.

An enlarged photograph. A fleet of vessels and boats engaged in pollock fishing off Cape Ann. A pinkey in the foreground has fishermen in the act of hauling fish on deck. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Massachusetts Bay, 1882. (277) 1,940. U. S. Fish Commission.

DORY HAND-LINING.

A crayon sketch showing the crew of a Gloucester fishing schooner distributed over the fishing-grounds on the Western Banks and actively engaged in catching codfish with hand-lines. The view shows eight dories, with one man in each, and the vessel at anchor in the distance. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

ICE-FISHING.

An India-ink drawing of fishermen engaged in fishing through the ice on Lake Michigan with lines. The lines are rigged with a pole and flag, the poles being set in such a way that when a fish pulls the line the flag comes up, signaling to the fisherman, who is standing behind the temporary shelter to screen him from the wind. Size, 30 by 40 inches. Lake Michigan, 1882. Henry W. Elliott.

SHORE HAND-LINE FISHING.

A crayon sketch showing two New England fishermen engaged in hand-lining for cod from a common fishing boat on the shore grounds off Gloucester, Mass. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

CATCHING BIRDS FOR BAIT.

A crayon picture showing fishermen in a dory on western banks catching hagdons, to be used as bait on their hand-lines in fishing for cod. The boat is surrounded by birds which have been "tolled up" by fish-lines, which the men have thrown overboard to attract them. Formerly great quantities of birds were taken by the Cape Cod fishermen, but of late they are seldom caught, as fishermen find it more economical to take bait from home or to run in to Newfoundland or Nova Scotia and buy fresh herring, capelin, and squid. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

HAND-LINING ON GEORGE'S.

An oil painting representing a Cape Ann fishing schooner anchored on George's Bank, the crew engaged in catching cod with hand-lines from the vessel's deck. The view shows the vessel at anchor and the spray dashing over the bow. Size, 30 by 40 inches.

DRESSING MACKEREL ON SHIPBOARD.

A crayon sketch showing a portion of the crew of a mackerel hand-liner dressing their catch to be salted and packed before stowing in the vessel's hold. Size, 30 by 40 inches. Massachusetts Bay, 1882. H. W. Elliott and J. W. Collins.

15. HOOKS WITH STATIONARY LINES.—SET TACKLE.

BOTTOM SET LINES.

TRAWL OR LONG LINES.

INDIAN TRAWL-LINE.

Ground-line made of cedar roots (*Thuja excelsa*); gangings of whalebone and cedar; hooks of cedar and iron. Indians of Vancouver Island. Collected by Dr. T. T. Minor. 6,560. Used by the Indians of the Northwest coast in the ocean fisheries.

HALIBUT TRAWL-LINE (section).

Ground-line 52 feet long, of 28-pound steam-tarred cotton. Gangings 5 feet long of 16-pound steam-tarred cotton, fastened with lobster-twine beckets, 10 feet 6 inches apart on ground-line. Cast-steel hooks, No. 2, Kirby, flatted. Gloucester, Mass., 1882. 54,701. U. S. Fish Commission. A full set of trawls for a halibut vessel is about 54,000 feet long, with from 3,600 to 5,000 hooks. It is made up into twenty-four "skates," or parts, each 375 fathoms long, and each dory usually sets four "skates." (See full-rigged halibut trawl.)

COD TRAWL-LINE (section).

Ground-line 35 feet long, of 18-pound steam-tarred cotton. Gangings 3 feet long, of 30-thread tanned cotton, 5 feet apart on ground-line. Central-draught eyed hooks, No. 4. Gloucester, Mass., 1882. 54,703. U. S. Fish Commission. A full set of trawls for a vessel in the cod fishery is 72,000 feet long, with from 14,400 to 15,000 hooks. It is made up in "tubs" or parts. each 1,500 to 3,000 feet long, and each dory sets from two to four tubs. (See full-rigged cod-trawl.)

COD-TRAWL.

Full rigged for use. Ground-line of 18-pound tarred cotton; gangings of 30-thread cotton; 500 hooks. The line is coiled in a tub and is fitted with buoys, anchors, buoy-lines, staves and black balls properly numbered. Gloucester, Mass., 1882. 54,513 to 54,520. U. S. Fish Commission. Used in the cod fisheries of New England.

HADDOCK TRAWL-LINE (section).

Ground-line 24 feet long, of 12-pound steam-tarred cotton. Gangings 27 inches long, of 24-thread tanned cotton, 40 inches apart on ground-line. Central-draught, eyed hooks, No. 15. Gloucester, Mass., 1882. 54,702. U. S. Fish Commission. A full set of trawls for a haddock vessel is 60,000 feet long with 18,000 hooks. It is made up in "tubs" or parts, each 1,750 feet long, and each dory sets from 6 to 8 "tubs." (See full rigged haddock trawl.)

HADDOCK TRAWL-LINE (section).

Ground-line 24 feet long, of 12-pound steam-tarred cotton. Gangings 27 inches long, of 30-thread cotton, 40 inches apart on ground-line. Center-draught, eyed hooks, No. 15. Gloucester, Mass., 1882. 54,702 (*a*). U. S. Fish Commission.

HADDOCK TRAWL.

Full rigged for use. Ground-line of 14-pound tarred cotton; gangings of 30-thread cotton; 500 No. 16 hooks. The line is coiled in a tub and fitted with buoys, anchors, buoy-lines, staves, and black balls properly numbered. Gloucester, Mass., 1882. 54,528 to 54,531. U. S. Fish Commission. The common style of trawl used in the fresh-haddock fishery.

SHORE TRAWL.

Two sections in baskets, rigged for use. Length of ground-line in each 350 fathoms, with 415 hooks; underrunning-line and rock; iron killicks and warps; inner, outer, and end buoys with flags. Rockport, Mass., 1882. 54,535 to 54,541. U. S. Fish Commission. Used in near-shore fishing for cod, hake, and haddock.

LAY-OUT LINE.

Section; white cotton ground-line, with gangings 5½ inches long and 12 inches apart; small central-draught eyed hooks. Magnolia, Del., 1883. 57,562. Gift of M. S. Van Burkalow. Used in rivers and bays for catching cat fish. A full size lay-out line is from 50 to 200 feet long, and is held in position by stakes at either end or by weights with buoys attached.

UNDER-RUNNING STICK.

Hard wood, notched 2½ inches from upper end, slightly tapering at lower end. Length 25 inches, diameter 1 inch. Gloucester, Mass., 1883. 54,823. J. W. Collins. Used when under-running trawls.

PHOTOGRAPHS AND SKETCHES ILLUSTRATIVE OF THE TRAWL FISHERIES.

CLEARING TRAWLS.

Photograph showing schooner Ontario engaged in the haddock trawl fishery, with crew at work untangling and baiting trawls on deck. Size, 8 by 10 inches. Gloucester, Mass., 1882. (555) 2,093. U. S. Fish Commission.

BAITING TRAWLS.

Photographs of schooner Lydia A. Harvey, Capt. John Clancey, engaged in haddock trawling from Boston. Showing the men at work on deck baiting up their trawls. Taken while lying at Commercial wharf. Size 8 by 10 inches. Boston, Mass., 1882. (16) 1,810. U. S. Fish Commission.

BAITING UP.

Photograph of a Gloucester schooner, engaged in the Grand Bank cod-fisheries, under sail, with a small herring-weir boat alongside, from which herring are being bailed on deck and packed in ice below to serve as bait in the trawl fishery. Size, 8 by 10 inches. Taken at Eastport, Me., 1882. (234) 1,918. U. S. Fish Commission.

BAITING TRAWLS.

Photograph of schooner Mystic, of Gloucester, engaged in the haddock trawl fishery, showing crew of Nova Scotia fishermen at work baiting trawls on deck, preparatory to setting them. Size, 8 by 10 inches. Massachusetts Bay, 1882. (524) 2,066. U. S. Fish Commission.

TRAWL FISHING.

Photograph showing Albert Norwood and Frederick Giles hauling a dog-fish trawl into a dory. The picture shows a fish just coming over the gunwale of the boat, and a fisherman in the act of killing it with a club. Size, 8 by 10 inches. Taken at Rockport, Mass., 1882. (64) 1,832. U. S. Fish Commission.

DRESSING HALIBUT.

Photograph of schooner Willie M. Stevens, of Gloucester, engaged in halibut trawl fishing, showing the method of dressing fish on deck before icing them in the vessel's hold. Size, 8 by 10 inches. Gloucester, Mass., 1882. (330) 1,974. U. S. Fish Commission.

HADDOCK.

Photograph of deck of schooner Belle A. Keyes, of Boston, engaged in haddock trawling. Showing trawls upon the deck, and

HADDOCK—Continued.

the crew in the act of "hoisting out" the cargo. Size, 8 by 10 inches. Taken while lying at Commercial Dock, Boston, Mass., 1882. (6) 1,804. U. S. Fish Commission.

UNLOADING CODFISH.

Photograph of view showing the unloading, culling, weighing, and wheeling of Grand Bank codfish at the wharf of Parmenter, Rice & Co., Gloucester, Mass., 1882. Size, 8 by 10 inches. (293) 1,952. U. S. Fish Commission.

BANK FISHERMEN BAITING TRAWLS.

Crayon drawing of crew of schooner Marion, of Gloucester, engaged in the halibut fishery, baiting trawls on deck preparatory to setting them. Size 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

SETTING COD TRAWLS.

India-ink drawing showing two Gloucester fishermen engaged in setting their trawls for codfish on the Western Banks from a fishing dory. The picture shows the fishing vessel at anchor in the distance, and three other dories getting ready to set their trawls. Size 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

SETTING TRAWLS UNDER SAIL.

A crayon sketch of a Gloucester schooner on the fishing grounds, with the crew engaged in setting their trawls while the vessel is under way. The drawing shows one dory setting the trawl, another about to begin, and the other still in tow of the vessel. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

CRABBING.

An India-ink drawing showing two Chesapeake negroes in an old-fashioned boat engaged in fishing a trot-line which has been set for crabs. One is hauling the line while the other uses the dip-net to secure the crab before it has let go of the bait. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

BAITING TRAWLS.

A crayon sketch showing a crew of Gloucester fishermen at work in the hold of the vessel baiting their trawls. The trawls are usually baited after the work of the day, by lamplight, in order that they may be ready to set by daybreak on the following morning. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

UNLOADING HALIBUT.

Photograph of the crew of a vessel engaged in the halibut trawl fishery unloading their cargo. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Gloucester, Mass., 1882. U. S. Fish Commission.

HALIBUT TRAWLING.

India-ink sketch showing a crew of Gloucester fishermen that have left the vessel in dories on the fishing banks to haul their trawls. The picture shows the men overtaken by a storm, with the spray and water dashing wildly over them. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

TRAWL-FISHING.

Photograph showing Albert Norwood and Frederick Giles hauling a dog-fish trawl into a dory. The picture shows a fish just coming over the gunwale of the boat, and a fisherman in the act of killing it with a club. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Taken at Rock port, Mass., 1882. (64) 1,832. U. S. Fish Commission.

BAITING TRAWLS.

Photograph of schooner Mystic, of Gloucester, engaged in the haddock trawl fishery, showing crew of Nova Scotia fishermen at work baiting trawls on deck, preparatory to setting them. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Massachusetts Bay, 1882. (524) 2,066. U. S. Fish Commission.

16. PARTS AND ACCESSORIES OF ANGLING AND DEEP-SEA FISHING-TACKLE, AND OF HARPOONING IMPLEMENTS.

HOOKS.

ABORIGINAL HOOKS.

SHELL HOOK.

Shank made from the hinge of a pearl-bearing shell (*Avicula margaritifera*); hook portion of border from probably the same species, made fast to shank with a seizing of some vegetable fiber Length, 5 inches. New Bedford, Mass., 1882. 68,139. U. S. Fish Commission. Called "Kanaka hook" by whalemen.

FISH-HOOK.

A barbless piece of curved copper in the end of short, flat, wooden shank. Length, $3\frac{3}{4}$ inches; spread, 1 inch. Etotowig, near Victoria Harbor, Victoria Land. 10,142. Capt. C. F. Hall.

FISH-HOOK.

Made of a piece of curved iron, barbless; long ganging of cord. Length, 2½ inches; spread, 1 inch. Pyramid Lake, Nevada. 1876. 19,064. Stephen Powers.

FISH-HOOK.

An iron nail driven through the end of a knotty piece of wood and secured with pitch. Length, 4½ inches. Wallapai Indians. 1870. 9,765. Dr. Edward Palmer.

FISH-HOOKS (3).

Straight, iron points, lashed to short, wooden stocks by serving of bark or fiber. Line, braided fiber. Length, 3 to 3½ inches; spread, ¾ to 1 inch. Chilkaht, Alaska, 1870. 9,807. Lieutenant F. W. Ring, U. S. A.

FISH-HOOK.

Made of bird's claw. Cooyuwee Pai Ute Indians. Length, 1½ inches; spread, ¾ inch. Pyramid Lake, Nevada, 1876. 19,064 (b). Stephen Powers.

FISH-HOOK.

Reindeer horn. Square shoulders instead of curves; sharp point, barbed; barb on bottom of shoulder. Hole in shank for attachment of line. Length, 2¼ inches; breadth, 1⅜ inches. Chesterfield Inlet, north of Hudson Bay, 1861. 72,609. Collected by Capt. H. C. Chester. Gift of Dr. Emil Bessels.

FISH-HOOKS (4).

Unbarbed, brass hooks at the ends of split quills which pass through a bone sinker at right angles; the sinker is fastened to the end of a short snood which depends from the end of a small pole. Length of stick, 12 inches. Spread of hooks, 7½ inches. Used as a grab-hook in catching small fish. Bristol Bay, Alaska, 1882. 55,926. Collected by Chas. L. McKay.

FISH-HOOKS (6).

Ivory shanks with rude iron points, unbarbed. Length, 1½ to 5⅜ inches. Bristol Bay, Alaska, 1882. 55,925. Collected by Charles L. McKay.

FISH-HOOK.

Hook of carved bone; back, carved from shell; bound together with sinew and cord of twisted vegetable fiber. Length, 4½ inches. Fiji Islands, 1840. 2,844. U. S. Exploring Expedition, Capt. Charles Wilkes, U. S. N.

FISH-HOOKS (4).

Shank made of a hemlock splint, the ends brought nearly together and held by a light lashing; short, wooden barb; line, twisted bark. Indians of Northwest coast. Length, 4 to 5½ inches. Bella Bella, British Columbia, 1876. 20,654. James G. Swan.

FISH-HOOKS (31).

Wood, stone, bone, or ivory shanks, with short, curved iron barbs. Many rudely carved and ornamented with inlaid beads, &c. Eskimo. Length, from 1 to 6 inches. Northwest coast of America. 1,441; 1,622; 2,093; 2,191; 2,192; 2,248; 5,117; 5,118. R. Kennicott and R. MacFarlane.

FISH-HOOK.

Wooden stock, slightly curved; straight, bone shank; no barb. Stock, 6 inches. Shank 4¼ inches. Yukon River, Alaska. 1,123. W. H. Dall.

FISH-HOOKS (14).

Bone or wooden shanks, through the lower end of which are passed barbless ivory, iron, or copper points. Gangings made of split quills, walrus whisker, or whalebone; some have stone or ivory sinkers with snoods; lines made of walrus hide, whalebone, &c. Used by Eskimo. Northwest coast of America, 1866. 2,197; 2,239; 4,324; 5,116; 5,590; 16,311. Robert Macfarlane and William H. Dall.

FISH-HOOKS (2).

Iron, joined by whalebone ganging. Russian manufacture. Length, 4 and 4½ inches; spread, 1 and 1¼ inches. Saint Lawrence Island, Alaska, 1873. 15,635. Henry W. Elliott.

FISH-HOOKS (4).

Straight, wooden stock, split at lower end to receive straight, bone shank; no barb; line made of twisted and braided sinew. Made by Thlinket Indians. Length of stocks, 3½ inches; shanks, 2½ to 3 inches. Sitka, Alaska. 16,311. William H. Dall.

FISH-HOOKS (2).

Titama; line and hooks for large fish; made of bits of greasewood about an inch long, each with a bit of bone firmly lashed to it at nearly a right angle, so arranged that, when taken in the mouth of the fish, it turns crosswise. Cooyuwee Pai Ute Indians. Length, 2½ inches; spread, ¾ inch. Pyramid Lake, Nev., 1876. 19,064 (a). Stephen Powers.

HALIBUT-HOOK.

Two pieces of wood seized with a cedar withe. Barbless spear, common nail, sharpened, lashed to upper end of arm with withes of cedar rootlets. Cedar withes knotted to shank for tying hook to line. Upper end of shank ornamented with head of a water-fowl. Length, 10¾ inches. Sitka, Alaska. 42,976. Gift of Commander L. A. Beardslee, United States Navy.

HALIBUT-HOOK.

Shank and arm, wood; barb, metal; lanyards for tying to line, rootlets of cedar. Shank ornamented with head of a bird. Barb lashed to upper end of arm with cedar rootlets. Old. Length, 11⅔ inches; spread, 3¾ inches. Alaska. 56,449 (b). James G. Swan.

HALIBUT-HOOK.

Wood, two pieces; shank and arm lashed with cedar rootlets. Shank ornamented at upper end with the head of an animal—apparently some design of fancy—and a rigid cleat. Metal barbs lashed to upper end of arm with rootlets of cedar. Small lanyard for attaching the hook to line, rootlets of cedar. Has been used. Length, 9½ inches; spread, 3⅝ inches. Alaska. 56,449 (c). James G. Swan.

HALIBUT-HOOK.

New. Shank and arm, wood, lashed in two places with rootlets of cedar. Shanks carved with the totem of some animal. Withes made of cedar rootlets for "bending on to line." Metal barb seized to upper end of arm. Length, 10 inches; spread, 4⅞ inches. Alaska. 60,177. J. J. McLean.

HALIBUT-HOOK.

Apparently new. Shank and arm, wood, lashed with cedar rootlets. Shank carved—figure of man holding two fishes. Barb wanting. Lanyard for attaching hook to line; cedar rootlets knotted in shank. Length, 10½ inches; spread, 3⅞ inches. Alaska. 60,178. J. J. McLean.

HALIBUT-HOOK.

Wood; shank and arm lashed together. Shank carved with grotesque figure of a man. Metal barb seized to end of arm with rootlets of cedar. Has been used. Length, 11½ inches; spread, 4 inches. Alaska. 60,179. J. J. McLean.

HALIBUT-HOOKS.

Made of splints from hemlock knots usually taken from decayed logs. Length, 6 inches. Makah Indians, Cape Flattery, Washington

HALIBUT-HOOKS—Continued.

Territory, 1883. 72,648 to 72,650. James G. Swan. The knots are split into small pieces, and after being shaped with a knife they are inserted in a hollow piece of kelp-stem and steamed in hot ashes until pliable. They are then bent into the required shape and tied. A barbless bone spur is firmly lashed to the lower side of the hook with slips or thin ribbons of spruce, or with strips of the bark of wild cherry. The upper end of the hook is recurved and served with bark to prevent splitting. A thread, made of whale sinew, is usually fastened to the hook for the purpose of tying on the bait, which is commonly a piece of an arm of the cuttle-fish or squid (*Octopus tuberculatus*). Another piece of loosely-twisted cord of sinew is used to fasten the hook to the line. As the mouth of the halibut is vertical, instead of horizontal, like that of most other kinds of fish, it readily takes the hook, the upper portion of which passes outside and over the corner of the mouth and acts as a spring to fasten the barb into the fish's jaw.

HALIBUT-HOOKS (13).

Curved wooden stock, with straight bone shanks; no barbs. Used by Indians. Length, 4½ to 10 inches. Northwest coast of America.

HALIBUT-HOOKS (3).

Wooden stock and shank lashed together at a point; bone barbs. Made by Indians. Length, 6½ inches; barbs, 1½ to 2 inches. Northwest coast of America. 653. Collected by George Gibbs.

HALIBUT-HOOKS (6).

Wooden stocks and shanks, lashed together in a point at lower ends; iron barbs; stocks grotesquely carved; gangings, made from the long fibrous roots of the spruce, are rove through middle of stocks. Length, from 10 to 12½ inches; spread, from 4 to 6 inches. Alaska. 1,153; 9,103; 9,104; 9,271; 20,889.

HALIBUT-HOOKS (6).

Wooden stocks and shanks, lashed together in a point at lower end; iron barbs; stocks rudely carved to represent human figures, fish, birds' heads, &c.; gangings, made from the long fibrous roots of the spruce, rove through middle of stocks. Length, 9 to 12 inches; spread, 5 to 5½ inches. Northwest coast of America. 1873–'75. 16,315; 18,909; 20,750. Collected by William H. Dall and James G. Swan.

HALIBUT-HOOKS (5).

Wooden stocks and shanks, lashed together in a point at lower ends, or cut from a single curved knot; iron barbs; some stocks

HALIBUT-HOOKS (5)—Continued.

curved, others plain; gangings, made from the long fibrous roots of the spruce or of twisted grass (?), are rove through or bent on to the middle of stocks. Length, from 9½ to 12 inches; spread, from 4½ to 6 inches. Northwest coast of America, 1875. 20,649; 20,650; 20,652; 20,656; 20,657. Collected by James G. Swan.

HALIBUT-HOOK.

Straight, wooden stock; straight, bone shank, lashed to lower end at an angle of about 45 degrees; no barb; line of twisted bark. Length: Stock, 6½ inches; shank, 4 inches. Bella Bella, British Columbia, 1876. 20,651. Collected by James G. Swan.

BUTT-END OF HEMLOCK LIMB.

Prepared for steaming and making a halibut-hook. Makah Indians. Length, 12½ inches. Puget Sound, Washington Territory, 1873. 1,141. Collected by James G. Swan.

COD-HOOK.

Leaders and snells, whalebone (baleen); hooks, ivory, straight and barbless, seized with bark strips. Length, 23 inches. Makah Indians, Neah Bay, Washington Territory, 1883. 72,651. James G. Swan. Used for catching the green rock cod, or cultus cod (*Ophiodon elongatus*), the "Toosh kow" of the Makah Indians.

CODFISH HOOKS (4).

Long whalebone stock, to the lower end of which is fastened a bone shank by serving of bark; no barb; the upper end is bent into an eye, through which the line is fastened. Used by Esquimo. Length, 12½ to 13½ inches. Northwest Coast of America. 243.

CODFISH HOOK.

Wood; straight stock and shank, lashed together with thin strips of rattan; no barb; to the upper end of stock is lashed a small stone sinker. Made by Makah Indians. Length of stock, 11 inches; shank, 5 inches. Neah Bay, Washington Ter., 1874. 14,280. James G. Swan.

MODERN HOOKS, PLAIN.

Single hooks.

HOOK MANUFACTURE.

The ten processes through which American hand-made fish-hooks pass from the wire to the finished hook. Made entirely by hand-labor in the factory of J. W. Court, Brooklyn, N. Y. 25,682. Bradford & Anthony, Boston, Mass.

CARLISLE HOOKS.—Tied to gimp. 25,546.

CARLISLE TROUT HOOKS.

Ringed. 25,521. Flatted. 25,520.

CARLISLE KIRBY HOOKS FOR BASS.—Tied to double gut. 42,873 (b.)

CARLISLE KIRBY HOOKS FOR BLUEFISH AND PICKEREL.

Tied to gimp. 42,873 (a.)

KIRBY RIVER AND TROUT HOOKS.

Ringed. 25,522. Flatted. 25,523. Spear points, ringed. 25,522 (a.)

KIRBY SALMON HOOKS.—Flatted. 25,519.

KIRBY SEA-FISH HOOKS.

Flatted. 25,528. Flatted and galvanized. 25,529. Ringed. The two largest sizes for halibut trawls. 25,530.

KINSEY TROUT HOOKS.

Ringed. 25,591. Tied to gut. 25,540. Flatted. 25,525.

KINSEY HOOKS FOR BASS.—Tied to double gut. 42,873 (d).

HOLLOW-POINT LIMERICK HOOKS.

Tied to double gut. 25,543. Tied to twisted gut. 25,544. Tied to gimp. 25,545. Ringed. 57,025.

HOLLW-POINT LIMERICK TROUT HOOKS.—Tied to gut. 25,939.

LIMERICK RIVER AND TROUT HOOKS.

Spear points, flatted. 25,515. Spear points, ringed. 25,514; 57,026.

LIMERICK SALMON HOOKS.

Hollow point, flatted. 25,516. Hollow point, ringed. 25,517.

LIMERICK HOOKS FOR BASS.—Tied to double gut. 42,873 (f).

LIMERICK HOOKS FOR PERCH.—Tied to double gut. 42,873 (g).

LIMERICK HOOKS FOR PICKEREL.—Tied to gimp. 42,873 (c).

VIRGINIA HOOKS.

Flatted, tapered points. 25,524. English make. A. B. Shipley & Son. 57,054. Wm. Mills & Son. 56,988.

ABERDEEN HOOKS.

Tied to gut. 25,542. English make. Wm. Mills & Son. 56,984.

ABERDEEN TROUT HOOKS.—Flatted. Graded sizes. 25,518.

FISH HOOKS.—Rhode Island patterns. 57,057–8.

NEW YORK TROUT HOOKS.—English make. Wm. Mills & Son. 56,982.

NEW YORK BASS HOOKS.

Tied to gut. 25,541. English make. Wm. Mills & Son. 56,983.

SNECK HOOKS.—English make. Wm. Mills & Son. 56,985.

SPROAT HOOKS.

Tapered ends. English make. William Mills & Son. 56,986.

CHESTERTOWN HOOKS.

English make. William Mills & Son. 56,987.

SHEEPSHEAD HOOKS.—English make. A. B. Shipley & Son. 57,055.

CENTRAL-DRAUGHT HOOKS.—Flatted. For cod hand-lines. 25,531. Eyed. Large size for cod and haddock trawls. 25,532. Ringed. For cod and haddock trawls. 25,533. Flatted. English make. William Mills & Son. 56,989.

HALIBUT HOOKS.

Straight shanks, ringed. 25,640.

COD HOOKS.

42,898. Flatted. 57,027; 25,526. Ringed. 25,527.

MACKEREL AND EEL HOOKS.

Drop point, flatted and ringed. 25,536 and 25,534.

BLACKFISH HOOKS.

English make. William Mills & Son. 56,980. Taperpoints. English make. William Mills & Son. 56,981. Japanned and flatted. 25,535.

BLUEFISH HOOKS.

42,897. Mounted on piano wire. 42,881. Mounted on brass snells. 42,896.

HORSE-MACKEREL HOOK.

Made of galvanized iron, ringed, curved shank. Length, 9½ inches; spread, 3½ inches. Belfast, Me., 1877. 29,467. Gift of John Thomas.

DOGFISH HOOKS.

Straight shanks, ringed. 25,641.

GROUND-SHARK HOOK.

Pattern of 1840. Made of galvanized iron, rigged with chain ganging; length of hook, 10½ inches; spread, 3 inches. Provincetown, Mass., 1877. 29,464. Gift of Elisha Cook.

SHARK HOOK.

Made of galvanized iron, ringed. Length, 10 inches; spread, 3 inches. Wellfleet, Mass., 1877. 29,465. Gift of M. W. Grant.

SHARK HOOKS.

Made of iron, painted black; chain gangings; straight and curved shank hooks. Series of eight sizes, for small and large sharks. U. S. Fish Commission. 25,538.

SHARK HOOKS.

Made of iron, painted black; very large and heavy; chain gangings, with swivels; two sizes. Length of hooks, 18 inches. U. S. Fish Commission. 25,538 *a*.

"FORGED" O'SHAUGHNESSY HOOKS.

Tied to double gut. 42,873 *e*.

SAMPLES OF FISH-HOOKS USED IN SEA FISHERIES.

Manufactured by J. W. Court & Co., Brooklyn, N. Y. These hooks are mostly used in the cod, haddock, hake, halibut, and mackerel fisheries, though the latter fishery is now conducted almost entirely with the purse-seine. The central-draught hooks are the latest pattern, and are usually given the preference over the straight-shank hook. No. 10, central-draught, and No. 6,281 straight-shank are used for large codfish in hand-line fishing, and Nos. 11, 12, and 13, and 6,282 to 6,284 for smaller fish. No. 14 is a Grand Bank trawl hook, and 15, 16, and 17 are for haddock trawls. Exhibited by Nickerson & Baxter, Boston, Mass.

BARBLESS HOOKS.

Samples of home-made barbless hooks used in trout and bass fishing. Exhibited by Monroe A. Green, Mumford, N. Y.

Treble hooks.

BRIGHT TREBLE HOOKS.

Eyed. English make. William Mills & Son. 56,991.

TREBLE HOOKS.

Bright. English make. A. B. Shipley & Son. 57,056.

TREBLE HOOKS.

Spring shank. English make. William Mills & Son. 56,990.

MODERN HOOKS, DECORATED.

(Those partially covered with artificial animals, feathers, bright-colored cloth, or metal spoons and spinners, or other devices for alluring the fish and causing them to take the hook.)

Jigs and drails.

MACKEREL JIGS.

Old style. 39,175. Pattern of 1840. 25,941. Gloucester pattern. Style of 1850. 32,734. Cape Ann patterns. 29,479; 39,171. Rhode Island pattern. 25,599.

WEAKFISH JIG.—Rhode Island pattern. 25,600.

CODFISH JIGS.—Cape Cod patterns of 1850. 25,601; 29,461.

BLUEFISH DRAILS.

Hook-shanks covered with eelskin and cotton cloth. Cape Cod and Rhode Island varieties. 24,807; 24,809; 29,425.

BLUEFISH DRAIL.

Hook with shank-mold in lead, shape of fish; leather strap. Wellfleet, Mass., 1830. 29,485. Gift of Newell B. Rich.

BLUEFISH DRAILS.

Plain and galvanized hooks, variously mounted in lead, ivory, and pearl. Used along the coasts of Southern New England and New Jersey in trolling for bluefish.

BLUEFISH DRAILS.

Varieties of pearl and metal mounted hooks; double hook gear. U. S. Fish Commission. 57,677.

BASS AND BLUEFISH DRAILS.

Various designs; hook-shanks mounted with cedar, bone, or cloth. U. S. Fish Commission. 29,448; 57,677; 57,678.

BLUEFISH SQUIDS.

Revolving metals, double hooks. U. S. Fish Commission (C., B. & M.), 1880. 42,895.

DOLPHIN DRAIL.

Long hook, shank covered with blue cotton, baited with white cotton cloth. Gloucester, Mass., 1883. 57,044. Capt. J. W. Collins. Carried on merchant vessels; used in tropical waters for the capture of dolphins.

MACKEREL-JIG MOLDS.

Style of 1840. 39,174. Patent, 1870. 23,780. Style of 1880. 39,173 Lead-lined. 25,781. Jig partly formed. 25,782; 39,171*a*.

SKIN OF DOGFISH.—For smoothing jigs. 56,954.

STEEL FILE.—For smoothing jigs and hooks. 54,398.

JIG-RASP.—For shaping jigs. 54,397.

JIG-LADLE.—For pouring lead into molds. 54,383.

LEAD FOR MAKING JIGS.—32,663.

Artificial minnows, etc. (made to represent the minnows, etc., on which the fish feeds).

ARTIFICIAL BAITS.

Soft-rubber crawfish, helgamites, frogs, grasshopper, May fly, and cricket. William Mills & Son. 57,003; 57,004; 57,012.

PHANTOM MINNOWS.

Made of silk coated with rubber, very light. Mounted with three treble hooks. William Mills & Son. 57,008.

PROTEAN MINNOWS.

Made of soft rubber, with snells and treble hooks. William Mills & Son. 57,010.

CALEDONIAN MINNOWS.

Made of hard rubber, with snells and treble hooks. William Mills & Son. 57,009.

ARTIFICIAL BAITS.

Minnows made of pearl, for single or double hooks. Centennial collection, 1876. 25,666. Gift of William M. Young.

ARTIFICIAL BAIT.

Metal minnow, treble hook, wire snell, with swivel. U. S. Fish Commission, 1876. 25,550 *c*.

MINNOW GANGS.

Single and treble hooks, mounted on gut and gimp snells and rigged with swivels. William Mills & Son, New York. 56,992.

Spoon baits.

SPOON BAITS.

Nickel-plated spoons, double hooks, trimmed with feathers. Syracuse, N. Y., 1876. 25,549*a*. Made by John H. Mann.

MACHARG'S PEARL SPOONS.

Made of pearl, with treble hooks trimmed with feathers; fitted with swivels and snells. U. S. Fish Commission (B. & A.), 1876. 25,550*a*.

SPOON BAITS.

Plated spoons, treble hooks, feather-trimmed, swivels and snells. Brooklyn, N. Y., 1876. 25,552. Made by W. H. James.

THE NEW ECLIPSE SPOON.

Nickel-plated and brass, feathered hooks; spring link from spoon to shaft. Value, 1883, $6.30 to $10 per dozen. William Mills & Son, New York. 57,006. One of the most successful spoons for taking black bass, pike, pickerel, and lake trout.

SPOON BAITS.

Silver-plated spoons, treble hooks, trimmed with feathers, rigged with swivels and gimp-snells. U. S. Fish Commission (C., B. & M.), 1880. 42,885; 42,886.

LONE STAR FLY-SPOON.

Face of spoon half gold and half nickel plated; four sizes. Value, 1883, $4.75 to $6.50 per dozen. William Mills & Son, New York. 57,005. This is a very light spoon, and desirable for black-bass fishing.

SPOON BAITS.

Metal spoons, plated; single and treble hooks, trimmed with feathers or tape. U. S. Fish Commission (C., B. & M.), 1880. 42,882.

SPOON BAITS.

Metal spoons; single and treble hooks; swivels and snells. U. S. Fish Commission (C., B. & M.), 1880. 42,882*a*.

SPOON BAITS.

Metal spoon; double and treble hooks, feathered and plain; brass and wire snells. U. S. Fish Commission. 42,882*c*.

SPOON BAITS.

Metal spoons, treble hooks, trimmed with feathers; wire spreaders. Whitehall, New York, 1876. 25,551*a*. Made by J. T. Buel.

BUEL'S BAITS.

Metal spinners, plain treble hooks, swivels, and snells. U. S. Fish Commission (B. & A.), 1876. 25,550*b*.

ARTIFICIAL BAITS.

Series of metal spoon-baits, nickel-plated; swivels; single and treble hooks. Centennial collection, 1876. 25,549. Made by John H. Mann, Syracuse, N. Y.

ARTIFICIAL BAITS.

Series of metal spoon baits; swivels and snells; single hooks. Centennial collection, 1876. 25,555. U. S. Fish Commission. Used in the capture of bass and bluefish.

BATES'S PATENT SPINNER.

English manufacture; two sizes. Value, 1883, $5 per dozen. 57,007. William Mills & Son, New York.

PEARL BAITS.

Spoons made of mottled pearl; double and treble hooks trimmed with white-ibis feathers. U. S. Fish Commission (C., B. & M.), 1880. 42,875.

SKINNER'S FLUTED BAIT.

Metal spoons, plated, fluted, treble hooks trimmed with feathers. Gananoque, Canada, 1876. 26,793. Made by G. M. Skinner.

CHAPMAN'S BAITS.

Minnow propellers made of metal; treble hooks, feathered. Value, 1882, $6 to $10 per dozen. U. S. Fish Commission (C., B. & M.). 42,883.

SPOON BAITS.

A large case containing samples of all the more important styles of spoon baits manufactured by L. S. Hill & Co.; also a framed card of illustrations of same. Exhibited by L. S. Hill & Co., Grand Rapids, Mich.

TROLLING-SPOONS.

A large case containing numerous varieties of trolling-spoons. Manufactured and exhibited by John Mann & Co., Syracuse, N. Y.

Artificial flies.

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS. 32,737.

Bradford & Anthony, Boston, Mass. [NOTE.—For convenience, this entire collection is provisionally entered under a single catalogue number.]

a. Peacock, with water-color sketch of original.

b. March brown, with water-color sketch of original. Body: Fur of the fox-squirrel's face ribbed over with olive silk. Tail: Two strands of brown feather of the wild mallard. Wings: From the side feathers of the shoveler duck approaching the tail; the light yeast-colored feather is the best, and, if nicely tied, must be an excellent fly. Legs: A grizzled cock's hackle, wound twice or thrice

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

at the shoulder. For Pennsylvania, hooks Nos. 6 to 8; for New York, hooks Nos. 5 and 6; New England, hooks Nos. 4 and 5.

c. Great red spinner, with water-color sketch of original.

d. Water-cricket, with water-color sketch of original.

e. Great dark drone, with water-color sketch of original.

f. Cow-dun. Body: Yellow mohair mixed with a little dingy brown fur from the bear. Wings: From the quill-feather of the curlew or whimbrel. Legs: Of a ginger-colored cock's hackle. For Pennsylvania, hooks Nos. 8 to 10; for New York, hook No. 8; for New England, hook No. 6.

g. Red fly, with water-color sketch of original. Body: The red part of squirrel's fur mixed with an equal quantity of claret mohair. Wings: The softest quill-feather of the pea-hen's wings. Legs: Claret-colored hackle; clip some of the upper fibers off that the wings may lie flat. For Pennsylvania, hook No. 6; for New York, hook No. 4; for New England, hook No. 3.

h. Blue dun, with water-color sketch of original. Body: Fur of a gray squirrel spun very thinly on fine yellow silk. Tail: Two fibers of a dun hackle. Wings: From a quill-feather of the blue-jay. Legs: Two or three turns of a ginger-dun hackle at the shoulder helps to keep the wings upright. For Pennsylvania, hook No. 6; for New York, hook No. 5; for New England, hook No. 4.

i. Red spinner, with water-color sketch of original. Body: Bright brown silk ribbed, with fine gold twist. Tail: two fibers of red cock's hackle. Wings: Upright from a mottled gray feather of the mallard stained a pale blue, the brighter in color the better. Legs: Plain red cock's hackle. For Pennsylvania, hook No. 6; for New York, hook No. 5; for New England, hook No. 4.

j. Nicholson.

k. Black dog.

l. Atkinson.

m. Policeman.

n. Claret wasp.

o. Blue wasp.

p. Wren-tail, with water-color sketch of original. Body: Ginger-colored fur ribbed with gold twist. Wings: Feathers from a wren's tail; if these cannot be procured a small scapular feather of the woodcock makes a good imitation, and may be hackled with the same kind of feather. For Pennsylvania, hook No. 10; for New York, hook No. 8; for New England, hook No. 6.

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

q. Red ant, with water-color sketch of original. Body: Peacock's herl tied with red-brown silk. Wings: From the quill-feather of the blue-jay. Legs: A small red cock's hackle.

r. Silver horns, with water-color sketch of original.

s. Golden-dun midge, with water-color sketch of original.

t. Sand-fly, with water-color sketch of original. Body: Of the sandy-colored fur from the rabbit's neck or from the fox-squirrel spun on silk of the same color. Wings: From the whimbrel wing made full. Legs: From a light ginger feather from the neck of a hen. For Pennsylvania, hooks Nos. 6 to 8; for New York, hooks Nos. 5 and 6; for New England, hooks Nos. 4 and 5.

u. Stone-fly, with water-color sketch of original. Body: Fur of the gray squirrel, when it is shortest is best, mixed with a little yellow mohair, leaving yellow about the tail. Tail: A strand or two of brown mottled feathers, say of mallard. Wings: From the soft inside feather of the pea-hen's wing. Legs: Blue-dun cock's hackle. For Pennsylvania, hooks Nos. 6 to 8; for New York, hooks Nos. 5 and 6; for New England, hooks Nos. 4 and 5.

v. Gravel bed, with water-color sketch of original. Body: Dark dun or lead-colored silk floss dressed very fine. Wings: From a covert feather of the woodcock's wing. Legs: A black cock's hackle, rather long, wound twice only round the body. For Pennsylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 6 to 8; for New England, hooks Nos. 5 and 6.

w. Grannum, with water-color sketch of original. Body: Fur of a rabbit's face with a little fine green mohair worked in at the tail. Wings: From the inside wing-feather of a grouse. Legs: A pale ginger hen's hackle. For Pennsylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 6 to 8; for New England, hooks Nos. 5 and 6.

x. Yellow dun, with water-color sketch of original. Body: Yellow mohair mixed with a little pale blue from a mouse or yellow floss silk with the least blue rabbit fur spun upon it. Wings: Upright, from the inside wing-feather of a mallard or summer duck. For Pennsylvania, hook No. 10; for New York, hook No. 8; for New England, hooks Nos. 5 and 6.

y. Iron-blue dun, with water-color sketch of original.

z. Hawthorn, with water-color sketch of original. Body: Black ostrich's herl. Wings: From the quill-feather of the English snipe. Legs: A black cock's hackle. For Penn-

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

sylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 6 to 8; for New England, hooks Nos. 5 and 6.

aa. Jenny spinner, with water-color sketch of original.

ab. Dennison. Body: Green floss silk ribbed with silver twist. Tail: Orange-tipped fibers of tippet, wood-duck, ibis, and green parrot. Legs: A golden yellow hackle. Wings: Of the following kinds—wood-duck, tippet, brown mallard, bustard, green parrot, blue and yellow macaw, with a few strands of red macaw; black ostrich head. Hooks, Nos. 1, 2, and 3.

ac. Deacon. Body: Bright yellow seal's fur ribbed with silver tinsel backed with gold twist. Tail: Sprigs of gray mallard and ibis. Legs: Bright yellow hackle. Wings: Strips of gray mallard dressed full; black ostrich head. Hooks, Nos. 2 and 3.

ad. Montreal. Body: Claret mohair ribbed with gold tinsel. Tail: Three or four fibers of scarlet ibis. Legs: Claret hackle. Wings: Brown turkey. Hooks, Nos. 1, 2, and 3.

ae. Rangely. Body: Dark claret mohair ribbed with gold tinsel. Tail: Fibers of wood-duck and ibis. Legs: Dark claret hackle. Wings: Strips of wood-duck mixed with sprigs of scarlet ibis. Hooks, Nos. 1, 2, and 3.

af. Tinseled ibis. Body: Silver tinsel ribbed with gold twist. Tail: A slip of wood-duck mixed with ibis. Legs: A covert wing-feather of the ibis. Wings: Strips from the large covert-feather of the ibis (the wing may be varied, adding a slip of wood-duck on each side); black ostrich head. Hooks, Nos. 1, 2, and 3.

ag. Lake George. Body: Gold twist ribbed with silver twist. Tail: A small China topping. Legs: A bright orange hackle with a shoulder of bright claret. Wings: Two tipped feathers mixed with argus pheasant, brown mallard; black ostrich head. Hooks, Nos. 1, 2, and 3.

ah. Chateaugay. Body: Lemon-yellow floss ribbed with gold twist. Tail: A few fibers of brown mallard. Legs: A ginger-colored cock's hackle. Wings: Strips of shoveler duck mixed with fibers of argus pheasant.

ai. Yellow drake. Body: yellow mohair ribbed with silver twist. Tail: Three fibers of yellow macaw. Legs: Yellow hackle with two turns of ibis on shoulder. Wings: Strips of gray mallard; black ostrich head. Hook, No. 3.

aj. Richardson. Body: A light-blue floss silk ribbed with silver twist. Tail: Three strands of brown mallard. Legs:

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

Black cock's hackle. Wings: Strips of English blue-jay mixed with brown mallard. Hooks, Nos. 3 and 4.

ak. Anthony.

al. Snow-fly.

am. Captain.

an. Combination. Body: First half, yellow seal's fur; second half, red claret seal ribbed with silver tinsel (the fur to be picked out). Tail: A few fibers of gray mallard mixed with ibis. Legs: A natural red hackle dipped in yellow dye. Wings: A piece of the same kind of hackle with pale ibis strips. On each side a piece of gray mallard sufficiently large to make the wing full; black ostrich head. Hooks, Nos. 1, 2, and 3.

ao. Silver Doctor. Body: Silver tinsel ribbed with gold twist- Tail: China pheasant topping. Legs: A pale-blue hackle with a small teal or guinea-hen at the shoulder. Wings: Mixed fibers of wood-duck, brown mallard, guinea-hen, green parrot, blue macaw, teal, and bustard; black ostrich head. Hooks, Nos. 2 and 3.

ap. Prouty. Body: First joint, silver twist; second, black ostrich with three turns of the twist over it. Tail: Orange floss with a turn or two of twist, a topping mixed with fibers of English blue-jay. Legs: A yellow dyed list hackle wound over the ostrich. Wings: Strips of white swan, dyed yellow. One each side a rib of teal-feather, red macaw feelers; black ostrich head. Hooks, Nos. 2 and 3.

aq. Black Cricket.

ar. Grasshopper.

as. Great Blow.

at. Cadiz.

au. Murray. Black silk floss ribbed with silver twist. Tail: A small feather from the neck of the scarlet ibis. Legs: A golden yellow hackle. Wings: Dark mottled turkey; black ostrich head. Hooks, Nos. 1 and 2.

av. Round Lake.

aw. Nameless. Body: Brown ostrich herl, ribbed with gold twist, tag orange floss. Tail: Two or three short sprigs of yellow macaw. Legs: A small sooty orange hackle, wound from tag to shoulder. Wings: Alternate strips of brown peacock-wing feather and shoveler duck, with a sprig or two of wood-duck; peacock herl head. Hooks, Nos. 1, 2, and 3.

ax. Rackette. Is made in two joints of black orange mohair, with gold tinsel. Legs: A dyed black hackle wound from tail to head. Tail: Bright yellow toucan. Wings:

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

A mixture of gold pheasant tail, argus, and teal. Hooks Nos. 1, 2, and 3.

ay. Priest.

az. Francis Sykes.

ba. Duke.

bb. Dhoon.

bc. Dustin.

bd. Lascelles.

be. Snitching Sandy.

bf. Prouty.

bg. Grace.

bh. Powells.

bi. Hawthorne.

bj. Edmonson.

bk. Whitcher.

bl. Carshalton.

bm. Professor. Body: Yellow mohair or silk floss, ribbed with silver twist or tinsel. Tail: Two or three strands of scarlet ibis wing-feathers. Wings: From the gray ibis.

bn. Coughton.

bo. Alder.

bp. Chantry.

bq. Kingdom.

br. Hoflan Fancy.

bs. Coachman. Body: Peacock's herl. Wings: From a white hen's wing-feather, or a pigeon wing-feather will answer the purpose. Legs: A red cock's hackle wound twice or thrice at the shoulder. For Pennsylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 5 and 6; for New England, hooks Nos. 4 and 5.

bt. Willow.

bu. Prouty.

bv. Notion. Body: First half gold twist, remainder brown mohair, with three turns of the twist over it. Tail: A topping mixed with blue kingfisher. Legs: Brown hackle. Wings: Two tipped feathers mixed with argus pheasant, brown mallard, teal, China pheasant tail-feathers, blue and yellow macaw, with a blue kingfisher on each side of the wing; black ostrich head. Hooks, Nos. 2 and 3.

bw. Louise. Body: Brown mohair ribbed with gold twist. Tail: China feather topping. Legs: Reddish-brown hackle, blue-jay on shoulder. Wings: Pheasant tippet feather and tail mixed with sprigs of green parrot, blue macaw, and kingfisher. Head: Orange mohair. Hooks, Nos. 1 and 2.

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

bx. Round Lake. Body: Orange and red claret merging into each other, silver tinselled. Tail: Sprigs of gold pheasant tippet, blue macaw, and green parrakeet. Legs: A claret hackle with a turn or two of orange on the shoulder. Wings: Two strips of brown turkey, with a small jungle-cock's feather on each side. Hooks, Nos. 1, 2, and 3.

by. Nicholson.

bz. Our pattern.

ca. Saranac. Body: Claret floss silk ribbed with gold tinsel, backed with silver twist. Tail: China pheasant crest-feather. Legs: A claret hackle. Wings: Two China pheasant tippet feathers on each side, a strip or two of brown mallard and argus pheasant; black ostrich head. Hooks, Nos. 1–0, 2, and 3.

cb. Long Tom of Long Lake. Body: Gray squirrel mixed with a little green mohair ribbed with silver tinsel. Tail: China pheasant crest-feather. Legs: A blue dun cock's hackle; at shoulder two or three turns of bright claret hackle. Wings: Strips of brown mallard mixed with strands of summer duck, peacock-wing, and upper coverts of the wild turkey, red macaw feelers; black plush head. Hooks, Nos. 1, 2, and 3.

cc. St. Regis. Body: Cinnamon mohair ribbed with double gold twist. Tail: A strip of China pheasant tippet mixed with a few strands of bustard. Legs: A chestnut hackle with three turns or so of orange-dyed guinea-hen, small and short in the fibers. Wings: Strips of brown mallard, brown turkey, English pheasant tail, and China tippet; black ostrich head. Hooks, Nos. 1 and 2.

cd. No. 8. Body: Three or four turns of mohair, rest of black mohair ribbed with silver tinsel and backed with gold twist. Tail: A small topping. Legs: A dyed black hackle and a shoulder of red claret. Wings: Mixed fibers of mallard, guinea-hen tail-feather over wing, two strips of dark turkey tipped with white. Hooks, Nos. 2 and 3.

ce. Highlander.

cf. Lady of Mertoun. Body: Water-rat's fur ribbed with silver twist. Tail: A tip of common ostrich or mohair and a gold pheasant topping. Legs: Two or three turns of a small red hackle finished off with a black hackle. Wings: Strips of dark-gray mallard. Head: Crimson ostrich or mohair. Hooks, Nos. 1–0, 1, and 2.

cg. Toppy. Body: Black mohair ribbed with silver tinsel. Tail: A topping tip crimson. Legs: A turn or two of red

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

hackle, the rest black hackle. Wings: Black or brown turkey tipped with white. Head: Crimson. Hooks, Nos. 1–0, 1, and 2.

ch. Sapper. Body: Orange mohair ribbed with gold tinsel. Tail: Fibers of green parrot, guinea-hen, tippet feather, and ibis. Legs: Orange hackle, shoulder a dyed black hackle. Wings: Strips of peacock-wing feather, brown mallard, green parrot, guinea-hen, gold pheasant tail, blue macaw feelers; black ostrich head. Hooks, Nos. 1–0 and 1.

ci. Stephens. Body: Brick-colored silk, ribbed with gold twist and blue tip. Tail: Gold pheasant topping. Legs: Hackle, same color as body. Wings: Gold pheasant tippet and slight mixture of mallard; black ostrich head. Hooks, No. 1.

cj. Jock Scott. Body: In two joints, gold-colored floss the lowest and black floss the upper; from the joint are tied two short toucan points, and over the butts of them at the joints two turns of black ostrich. Tail: One gold pheasant topping and one Indian crow feather. Legs: Black hackle over the black joint and speckled guinea-hen at the shoulder. Wings: A white tip turkey slip, in the middle fibers of bustard, teal, brown mallard, yellow, red, and green parrot, one topping over all; blue macaw feelers. A kingfisher on either cheek; black ostrich head. Hooks, Nos. 1–0, 1, and 2.

ck. Whitcher. Body: Black mohair ribbed with silver, tip yellow silk. Tail: Gold pheasant topping. Legs: Black hackle. Wings: A mixture of mallard and hooded merganser; black ostrich head. Hooks, Nos. 1 and 2.

cl. Nicholson. Body: Blood-red mohair ribbed with gold tinsel. Tail: Sprigs of mallard and pheasant tippet feather. Legs: A blood-red and dark-blue hackle wound on together. Wings: Brown mallard and blue macaw feelers; black ostrich head. Hooks, Nos. 1 and 2.

cm. Caribou. Body: Tip gold tinsel, tag golden-yellow silk, next a black silk joint, the rest of gray caribou. Legs: Gray hackle with a claret on the shoulder. Tail: Gold pheasant topping. Wings: Turkey and mallard with sprigs of macaw and pheasant tippet feather; black ostrich head. Hooks, Nos. 1–0 and 1.

cn. Moose. Body: Yellow floss ribbed with silver tinsel. Tail: A China pheasant topping. Legs: A yellow hackle; shoulder hackle a guinea-hen. Wings: Two tippet feathers of the China pheasant with fibers of mallard

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

wood duck on each side; black ostrich head. Hooks, Nos. 1, 2, and 3.

co. Moosehead. Body: Deep claret mohair ribbed with gold twist. Tail: A topping. Legs: A claret hackel, with three turns of orange hackle at the shoulder. Wings: Strips of brown mallard and tippet feather, with red macaw feelers; black ostrich head. Hooks, Nos. 1, 2, and 3.

cp. Fiery-brown. Body: Fiery brown mohair ribbed with gold tinsel. Tail: A small topping mixed with wood-duck. Legs: A brown-red hackle. Wings: Brown mallard, with a little wood-duck and golden pheasant neck-feather mixed; black head. Hooks, Nos. 1, 2, and 3.

cq. Parson. *cr.* Gold wing. *cs.* Gold Mallard. *ct.* Kircud-brightshire. *cu.* Eagle. *cv.* Tartan. *cw.* Last Fly. *cx.* Atkinson. *cy.* Strachan.

cz. Parson. Body: Black mohair tipped with orange and ribbed with silver twist. Tail: A small topping. Legs: A black hackle. Wings: Brown turkey-tail; black head. Hooks, Nos. 2 and 3.

da. Ross. Body: Cinnamon-colored floss ribbed with gold twist. Tail: Springs of green parrot. Legs: A furnace hackle. Wings: Brown mallard mixed with peacock herl; black ostrich head. Hooks, Nos. 1–0 and 1.

db. Forsyth. *dc.* Chamberlain. *dd.* Green. *de.* Whitcher. *df.* Langrin. *dg.* Emmet. *dh.* Captain. *di.* Major. *dj.* Darling. *dk.* Durham Ranger. *dl.* Goldfinch. *dm.* Britannia. *dn.* Popham. *do.* White Tip. *dp.* White Wing. *dq.* Drake Wing. *dr.* Dun Wing. *ds.* Black and Yellow. *dt.* Blue Doctor. *du.* Kate. *dv.* Ruggles.

dw. Little Yellow May Dun, with water-color sketch of original.

dx. Oak Fly, with water-color sketch of original. Body: Orange floss silk, ribbed with ash-colored silk thread or a little floss, the ash-color to be shown well at the tail and shoulders. Wings: From a scapular feather of the woodcock. Legs: A furnace hackle or cock's hackle, with a black list up the middle. For Pennslvania, hooks Nos. 8 to 10; For New York, hooks Nos. 6 to 8; for New England, hooks Nos. 5 and 6.

dy. Black Gnat, with water-color sketch of original. Body: Black ostrich herl. Wings: From the quill-feather of the rice-bird or grakle. Legs: Black hackle. For Pennsylvania, hooks Nos. 10 to 12; for New York, hooks Nos. 8 to 10; for New England, hook No. 8.

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

dz. Fern Fly, with water-color sketch of original. Body: Orange floss silk. Wings: From the quill-feather of the summer-duck wing; the smaller-sized hooks can be dressed from the wing-feather of the blue-jay. Legs: a red cock's hackle. For Pennsylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 6 to 8; For New England, hooks Nos. 5 and 6.

ea. Yellow Sally, with water-color sketch of original. Body: Any yellowish fur ribbed, with yellow or apple green-silk. Wings: From a wing-feather of a white hen or white pigeon stained pale yellow. Legs: A white cock's hackle, stained in the same dye. For Pennsylvania, hooks Nos. 6 to 8; for New York, hooks Nos. 5 and 6; for New England, hooks Nos. 4 and 5.

eb. Alder Fly, with water-color sketch of original. Body: Peacock's herl. Wings: From a feather of a brown hen's wing. Legs: A red cock's hackle or a black cock's hackle will answer tolerably well. For Pennsylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 5 and 6; for New England, hooks Nos. 4 and 5.

ec. Sky Blue, with water-color sketch of original.

ed. Little dark Spinner, with water color sketch of original.

ee. Turkey Brown, with water-color sketch of original.

ef. Magalloway. Body: Half black ostrich and half brown mohair, ribbed with gold twist. Tail: Short fibers of yellow macaw. Legs: A furnace hackle of the shoulder. Wings: Strips of brown quill feathers of the peacock; black ostrich head. Hook, No. 3.

eg. Bemis stream. Body: Chestnut mohair ribbed with gold tinsel. Tail: China pheasant topping. Legs: A chestnut hackle. Wings: Strips of brown peacock mixed with bustard. Hooks, Nos. 1 and 2.

eh. Mooselocmaguntick. Body: About equal parts mixed of gray squirrel's fur and pea-green mohair ribbed with gold twist. Tail: Four strands of argus feathers. Legs: A brown bittern hackle. Wings: Gray speckled turkey, white tipped (dye yellow), with a strip of argus feather on each side; green ostrich head. Hook, No. 1.

ei. Molechunkemunk. Body: Orange floss silk ribbed with gold tinsel, backed with silver twist. Tail: China pheasant topping. Legs: A furnace hackle. Wings: Brown mallard; black ostrich head.

ej. Willow Finch. Body: Yellow seal's fur ribbed with silver twist. Tail: Sprigs of tippet feathers mixed with yellow macaw. Legs: A yellow hackle, at the shoulder a small

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

guinea-hen stained yellow. Wings: Strips of swan feather dyed yellow with a spray of guinea-hen (tail-feather) dyed yellow; black ostrich head. Hooks, Nos. 1, 2, and 3.

ek. Oquassac. Body: Red claret mohair ribbed with pink floss. Tail: Yellow tag with pieces of argus and tippet feathers. Legs: A claret hackle. Wings: Strips from the quill-feather of the argus pheasant; black ostrich head. Hooks, Nos. 1–0 and 1.

el. Welokennebago. Body: Red pig's hair ribbed with broad gold tinsel, backed with silver twist. Tail: A mixture of black turkey tipped with white and scarlet ibis. Legs: Scarlet hackle. Wings: Fibers of red macaw mixed with strips of black and brown turkey, tipped with white; black ostrich head.

em. Capsuptuc. Body: Silver tinsel ribbed with gold twist. Tail: Fibers of China pheasant tail mixed with guinea-hen and red macaw. Legs: A brilliant scarlet hackle. Wings: Mixed and to be made full. Two strips of brown turkey tipped with white-brown mallard; China pheasant tail and guinea-hen; black ostrich head. Hooks, Nos. 1–0, 1, and 2.

en. Orange Grouse. *eo.* Thunder and Lightning. *ep.* Lough Gill. *eq.* Lillie. *er.* Black Ant. *es.* Blue Blow. *et.* Mare. *eu.* Hare's Ear. *ev.* Ibis. *ew.* Seth Green. *ex.* Red Creeper. *ey.* Turkey Brown. *ez.* Queen of the Waters. *fa.* Governor. *fb.* White Miller. *fc.* Lion. *fd.* Water-witch. *fe.* Atkinson. *ff.* Our Own Pattern.

fg. Green Drake, with water-color sketch of original. Body: Pale straw-colored floss silk ribbed with brown silk thread or floss; the extremities are of brown peacock's herl. Tail: Three rabbit's whiskers. Wings: Made from a mottled feather of mallard, stained a pale yellowish-green. Legs: A grizzled cock's hackle stained a yellowish-green in the same dye. For Pennsylvania, hooks Nos. 6 to 8; for New York, hooks Nos. 4 to 6; for New England, hooks Nos. 3 and 4.

fh. Gray Drake, with water-color sketch of original. Body: The middle part of white floss silk ribbed with silver twist; the extremities of brown peacock's herl. Tail: Three rabbit's whiskers. Wings: Made from a gray mottled feather of the mallard. Size of hooks same as green drake

fi. Orange Dun, with water-color sketch of original. This fly is equally attractive to trout, and is a prime favorite in

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

its day—the end of June, July, and August. Body: Dark orange silk. Tail: Two fibers of brown mallard feather. Wings: From the quill-feather of the large red-crowned woodpecker. For Pennsylvania, hooks Nos. 6 to 8; for New York, hook No. 6; for New England, hooks Nos. 5 and 6.

fj. Green mackerel, with water-color sketch of original.

fk. Brown mackerel, with water-color sketch of original.

fl. Marlow Buzz, with water-color sketch of original.

fm. Pale evening Dun, with water-color sketch of original.

fn. July Dun, with water-color sketch of original. Body: Mole's fur and pale-yellow mohair mixed and spun on yellow silk. Tail: Two or three whiskers of a dark dun hackle. Wings: From the quill-feather of a bluejay. Legs: Dark dun hackle. For Pennsylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 6 to 8; for New England, hooks Nos. 5 and 6.

fo. Gold-eyed gauge-wing, with water-color sketch of original.

fp. Butcher, No. 1. *fq.* Blue Ranger. *fr.* Black Ranger. *fs.* Colonel. *ft.* Children's Farlow. *fu.* Candlestick Maker. *fv.* Baker. *fw.* Butcher. *fx.* Namsen. *fy.* Black and Teal. *fz.* Guinea Hen. *ga.* Claret. *gb.* Inquichin. *gc.* Maxwell Ranger.

gd. August Dun, with water-color sketch of original. Body: Brown floss silk ribbed with yellow silk thread. Tail: Two rabbit's whiskers. Wings: Feather of a brown hen's wing. Legs: A dark red hackle. For Pennsylvania, hook No. 8; for New York, hook No. 6; for New England, hook No. 5.

ge. Orange, with water-color sketch of original. Body: Orange floss silk, ribbed with black silk. Wings: Dark part of the blue-jay's wing. Legs: A very dark furnace hackle. For Pennsylvania, hooks Nos. 8 to 10; for New York, hooks Nos. 6 to 8; for New England, hook No. 6.

gf. Cinnamon, with water-color sketch of original. Body: Fawn-colored floss silk, ribbed with red silk thread. Wings: Feather of a yellow-brown hen's wing. Legs: A ginger hackle. For Pennsylvania, hook No. 8; for New York, hook No. 6; for New England, hook No. 6.

gg. Blue-Bottle, with water-color sketch of original. Body: Bright blue floss silk, with a few turns of brown floss at the shoulder. Wings: From the quill-feather of a water-hen. Legs: Black hackle from a cock, wrapped down the principal part of the body. For Pennsylvania, hook No. 8; for New York, hook No. 6; for New England, hook No. 5.

ARTIFICIAL FLIES FOR SALMON, TROUT, AND BASS—Continued.

gh. Whirling Blue Dun, with water-color sketch of original. Body: Squirrel's red-brown fur, mixed with yellow mohair. Tail: One or two whisks of a pale ginger hackle. Wings: From the quill-feather of a mallard. For Pennsylvania, hook No. 8; for New York, hook No. 8; for New England, hook No. 6.

SALMON FLIES.

42867. Manufactured by Conroy, Bissett & Malleson, New York. U. S. Fish Commission.

a. Halifax. *b.* Curtis. *c.* Blue Sandy. *d.* Fairy. *e.* Unknown. *f.* Sapper. *g.* Silver Gray. *h.* Jock Scott. *i.* Claret Body. *j.* Fancy Yellow. *k.* Butcher. *l.* Popham. *m.* Silver Doctor. *n.* Red Blue. *o.* Fiery Brown. *p.* Claret Fairy. *q.* Unknown. *r.* Silver Doctor. *s.* Prouty. *t.* Jock Scott. *u.* Red Robin. *v.* Black Robin. *w.* Donkey. *x.* Dark Claret.

LAKE FLIES.

42868. Manufactured by Conroy, Bissett & Malleson, New York. U. S. Fish Commission.

a. Blue Dun. *b.* Professor. *c.* Grizzly King. *d.* Scarlet Ibis. *e.* Golden Pheasant. *f.* Grizzly Hackle. *g.* Coachman. *h.* Black Moose. *i.* Jungle Cock. *j.* Brown Hackle. *k.* Cow Dun. *l.* Yellow Sally. *m.* Yellow Moose. *n.* Turkey. *o.* Saranac. *p.* Black Fly. *q.* White Miller. *r.* White Miller (fall wings). *s.* Cow Dun. *t.* Black Hackle. *u.* Silver Doctor. *v.* Fiery Yellow. *w.* March Brown. *x.* Abbey. *y.* Yellow Body Moth.

BASS FLIES, USED FOR THE BLACK BASS (*Micropterus pallidus*).

42869. Manufactured by Conroy, Bissett & Malleson. U. S. Fish Commission.

a. Scarlet Ibis. *b.* Black Fly. *c.* Mealy Mouth. *d.* Turkey Brown. *e.* Yellow Ferguson. *f.* Page. *g.* Holberton's Humble Bee. *h.* Cape Vincent. *i.* Holberton. *j.* Ferguson. *k.* White Miller. *l.* Yellow Bee. *m.* St. Lawrence. *n.* Grizzly King. *o.* Mallard. *p.* Scarlet Moth. *q.* Scarlet Moth, No. 2. *r.* Mallard.

TROUT AND GRAYLING FLIES.

42871. Manufactured by Conroy, Bissett & Malleson, New York. U. S. Fish Commission.

a. Professor. *b.* Grizzly Hackle, or Palmer. *c.* Grey Drake. *d.* Yellow Sally. *e.* Black Gnat. *f.* Red Hackle, or

TROUT AND GRAYLING FLIES—Continued.

Palmer. *g*. Scarlet Ibis. *h*. Brown Hackle, or Palmer. *i*. Grizzly King. *j*. Black Fly. *k*. Blue Blow. *l*. White Miller. *m*. Olive Gnat. *n*. Green Body Black Fly. *o*. March Brown. *p*. Scarlet Body Black Fly. *q*. Great Dun. *r*. Claret Gnat. *s*. Jungle Cock. *t*. Golden Spinner. *u*. Cock-Y. *v*. Beaverkill. *w*. Grouse Hackle. *x*. Abbey or Jew Fly. *y*. Yellow Jungle Cock. *z*. Ginger Hackle. *aa*. Cow Dun. *ab*. Yellow May Fly or Green Drake. *ac*. Coachman. *ad*. Canada. *ae*. Shoemaker. *af*. Red Spinner. *ag*. Blue Dun. *ah*. Queen of the Water. *ai*. Black Hackles, or Palmer.

ai. Willow, with water-color sketch of original. Body: Mole's fur mixed with a little fine yellow mohair. Wings: From the quill-feather of a water-hen or coot. Legs: A dark dun hen's hackle. For Pennsylvania, hooks Nos. 8 to 10; for New York, hook No. 8; for New England, hooks Nos. 5 and 6.

aj. Snowy. *ak*. Beauty Snow.

al. Red Palmer, with water-color sketch of original. Body: Red mohair ribbed, with gold twist or tinsel. Legs: A blood-red cock's (saddle) hackle wrapped nicely over it, working the hackle closely together at the shoulder. For Pennsylvania, hooks Nos. 6, 8, and 10; for New York, hooks Nos. 4, 5, and 6; for New England, hooks Nos. 3, 4, and 5.

am. Black and Red Palmer, with water-color sketch of original.

an. Brown Palmer, with water-color sketch of original.

ao. Furnace. *ap*. Grizzle. *aq*. Ginger. *ar*. List. *as*. Soldier. *at*. White. *au*. Grizzle Peacock. *av*. Red. *aw*. Black Peacock. *ax*. Black. *ay*. Brown Peacock. *az*. Scarlet.

Fly-books.

HOLT PATENT FLY-BOOKS (two).

One with cover, one without. Manufactured by Abbey & Imbrie. 39,248. U. S. Fish Commission.

PERFECTION EXPANDING POCKET TACKLE-BOOK.

39,249. U. S. Fish Commission.

FLY-BOOKS.

Containing salmon, black bass, shad, grayling, and trout flies. Manufactured by Abbey & Imbrie, New York. 39,254. U. S. Fish Commission.

SALMON FLY-BOOK.

For carrying artificial flies. 25,548.

TROUT FLY-BOOK.

For carrying artificial flies. 25,547. Lent by Bradford & Anthony, Boston, Mass.

HOLBERTON FLY-BOOK.

For salmon flies. 39,208. U. S. Fish Commission. (C., B. & M.)

HOLBERTON FULL-LENGTH FLY-BOOK.

Capacity, 8 dozen flies. 39,209. U. S. Fish Commission. (C., B. & M.)

HOLBERTON FULL-LENGTH FLY-BOOK.

Capacity, 6 dozen flies. 39,210. U. S. Fish Commission. (C., B. & M.)

HOLBERTON FULL-LENGTH FLY-BOOK.

Capacity, 3 dozen flies. 39,211. U. S. Fish Commission. (C., B. & M.) All the Holberton fly-books mentioned above are intended to hold gut at full length, and are furnished with the improved "Hyde clips" for keeping the flies in place.

SNELL BOOK.

With changeable pockets. 39,212. U. S. Fish Commission. (C., B. & M.) This snell-book is of new style, and is very convenient for carrying a variety of flies.

SOUTHSIDE FLY-BOOK.

With Abbey & Imbrie's patent clip for holding flies at full length. $7\frac{3}{4}$ inches long. 39,247. U. S. Fish Commission. (A. & I.)

IMITATION SOUTHSIDE FLY-BOOK.

Eight inches long. 39,316. U. S. Fish Commission. (A. & I.)

IMITATION SOUTHSIDE FLY-BOOK.

Six inches long. 39,317. U. S. Fish Commission. (A. & I.)

The following fly-books were exhibited by Wakeman Holberton, of New York City, and entered for competition:

FULL-LENGTH HOLBERTON FLY-BOOKS.

No. $\frac{2}{0}$. Finest alligator-skin cover; capacity, 6 dozen trout flies. No. $\frac{0}{1}$. Russia cover; capacity, 3 dozen salmon or bass flies. No. 1. Russia cover; capacity, 1 gross trout flies. No. 2. Russia cover; capacity, 8 dozen trout flies. No. 3. Leather cover; capacity, 6 dozen trout flies. No. 4. Leather cover; capacity, 3 dozen trout flies. No. 5. Muslin cover; capacity, 3 dozen trout flies.

FULL-LENGTH HOLBERTON FLY-BOOKS—Continued.

Advantages claimed for these books.—"Flies are kept separate, straight, and at full length, so that the angler, when fishing, can attach them at once to the leader. No woolen leaves to attract moths. The finer qualities have a heavy blotting-paper leaf for drying the flies, and all have pockets between each leaf. These books have a greater capacity and are much less bulky than the old ones. The clips are of spring brass and silver plated, and will not tear out or come loose with ordinary use. These books were invented by W. Holberton, and are now universally used, and have been copied by all dealers."—(*Holberton.*)

HOLT PATENT FLY-BOOKS.

Leaves of morocco, with hooks and elastics to hold flies at full length. One with cover and one without. U. S. Fish Commission. (A. & I.) 39,215; 39,248.

SOUTHSIDE FLY-BOOK.

Leaves of American artificial parchment, with patent clips for holding flies at full length. Woolen pads for drying. U. S. Fish Commission. (A. & I.) 39,247.

IMITATION SOUTHSIDE FLY-BOOK.

Leaves of artificial parchment, with clip for holding flies at full length. Woolen drying pads. Length, 6 inches. U. S. Fish Commission. (A. & I.) 39,317.

IMITATION SOUTHSIDE FLY-BOOK.

Leaves of artificial parchment, with clips for holding flies at full length. Woolen drying pads. Length, 8 inches. U. S. Fish Commission. (A. & I.) 39,316.

FLY-BOOKS WITH FLIES.

These books contain an assortment of salmon, black-bass, shad, grayling, and trout flies. U. S. Fish Commission. (A. & I.) 39,254.

TACKLE-BOOK.

"Perfection expanding" pockets, with imitation alligator-leather covers. U. S. Fish Commission. (A. & I.) 39,249.

FISHING LINES AND SNOODS.

SILK LINES.

FISHING LINES.

Raw silk, braided, oiled. Assorted sizes, C to G. Length, 50 yards each. Centennial collection, 1876. 25,632. Made by G. H. Mansfield & Co., Canton, Mass. For anglers' use.

FISHING LINES.

Raw silk, braided. Assorted sizes, C to G. Length, 50 yards each. Centennial collection, 1876. 25,633. Made by G. H. Mansfield & Co., Canton, Mass. For anglers' use.

FISHING LINE.

Silk, oiled. Length, 100 yards. Value, 1880, $2. 42,777. U. S. Fish Commission. (C., B. & M.) Used by anglers in fishing for trout.

FISHING LINE.

Silk, oiled. Length, 100 yards. Value, 1880, $4. 42,767. U. S. Fish Commission. (C., B. & M.) Used by anglers in fishing for black bass.

FISHING LINE.

Silk, tapered, water-proof. (C.) Length, 50 yards. Value, 1883, $5. 57,589. U. S. Fish Commission. (C. & B.) Used by anglers for trout-fishing.

FISHING LINES.

Silk, waterproofed. Two sizes. Length, 30 and 50 yards each. Value, 1880, $2.40 and $4. 42,775 and 42,776. U. S. Fish Commission. The long line is for black bass, the short one for trout-fishing.

FISHING LINE.

Silk, braided, tapered. (B.) Length, 50 yards. Value, 1883, $5. 57,588. U. S. Fish Commission. (C. & B.) Used by anglers in fishing for grilse.

FISHING LINE.

Silk, braided, water-proof. (E.) Length, 100 yards. Value, 1880, $10. 42,774. U. S. Fish Commission. (C., B. & M.) Used by anglers in fishing for grilse.

FISHING LINES.

Silk, water-proof, braided and tapered. Assorted sizes and lengths. Value, 1880, $2 to $4 each. 39,250 to 39,253. U. S. Fish Commission. Used by anglers in fresh-water fishing.

FISHING LINE.

Silk, braided, tapered, water-proof. (No. 10.) Length, 120 yards. Value, 1880, $12. 42,766. U. S. Fish Commission. (C. B. & M.) Used by anglers in fishing for salmon with light rods.

FISHING LINES.

Silk, braided. Assorted grades and sizes for anglers' use. Length, 50 yards each. 25,628; 25,629; 42,765; 42,769; 42,778; 42,779.

FISHING LINES—Continued.

Value, 1880, $1.25 to $2 each. G. H. Mansfield & Co. and U. S. Fish Commission.

FISHING LINES.

Silk, braided. Assorted sizes, C and G. Length, 50 yards each. Centennial collection, 1876. 25,630. Made by G. H. Mansfield & Co., Canton, Mass. For anglers' use.

FISHING LINES.

Silk, braided, water-proof. Assorted sizes and lengths. Centennial collection, 1876. 25,627. Made by G. H. Mansfield & Co., Canton, Mass. For anglers' use.

The following silk lines were exhibited by William Mills & Son, of New York City, and entered for competition:

Salmon lines: Standard tapered silk (B and C), 120 yards each.
Fly lines: Standard level silk (E, F, and G), 100 yards each.
Braid-silk lines: Standard (C, D, E, F, G, and H), 50 yards each.
Fly lines: Standard tapered silk (F), each 30 and 50 yards.
Fly lines: Standard tapered (E), each 25 and 40 yards.
Silk leaders: Single, double, and twisted, Nos. 1 to 8; 3 feet, 6 feet, and 9 feet.

WATER-PROOF FLY-LINE.

Exhibited by A. B. Shipley & Sons, of Philadelphia, Pa.

LINEN LINES.

FISHING LINE.

Linen, shroud-laid, blue and red. (No. 0.) One dozen lines, 18 feet each. Value, 1882, $0.40 per dozen. 54,386. U. S. Fish Commission. Used for snoods or snapper lines on mackerel hand-lines.

FISHING LINE.

Linen, shroud-laid, blue and yellow. (No. 1.) One dozen lines, 18 feet each. Value, 1882, $0.40 per dozen. 54,387. U. S. Fish Commission. Used for snoods or snapper-lines on mackerel hand-lines.

FISHING LINE.

Linen, shroud-laid, blue and red. (No. 2.) One dozen lines, 18 feet each. Value, 1882, $0.60 per dozen. 54,388. U. S. Fish Commission. Used for snoods or snapper-lines on mackerel hand-lines.

FISHING LINE.

Linen, white, shroud-laid. (Small.) Length, 25 fathoms. Value, 1882, $2.40 per 300 fathoms. 54,355. Made by M. B. Jackman & Co., Newburyport, Mass. Used for snoods, 3 feet long, on pollock hand-lines.

FISHING LINE.

Linen, white, shroud-laid. (Large.) Length, 25 fathoms. Value, 1882, $3.60 per 300 fathoms. 54,357. Made by M. B. Jackman & Co., Newburyport, Mass. Used for snoods, 6 feet long, on George's cod hand-lines.

FISHING LINE.

Linen, shroud-laid. Length, 600 feet. Centennial collection, 1876. 25,637. Bradford & Anthony, Boston, Mass. Used by anglers in fishing for bass.

FISHING LINES.

Linen, braided. (Letters B, C, and D.) Length, 50 yards each. Centennial collection, 1876. 25,631. Made by G. H. Mansfield & Co., Canton, Mass. Used by anglers in fresh-water fishing.

FISHING LINES.

Linen, braided. (Letters E, F, and G.) Length, 50 yards each. Centennial collection, 1876. 25,631 (*a*). Made by G. H. Mansfield & Co., Canton, Mass. Used by anglers in fresh-water fishing.

FISHING LINES.

Linen, hard braid. (Nos. 1 to 5.) Length, 50 yards each. Centennial collection, 1876. 25,626. Made by G. H. Mansfield & Co., Canton, Mass. Used by anglers in fishing for trout.

FISHING LINES.

Linen. Assorted colors, grades, and lengths. Centennial collection, 1876. 25,613. Made by J. & S. Allen, Walpole, Mass. Used in pond and brook fishing.

FISHING LINES.

Linen. Assorted colors, grades, and lengths. Centennial collection, 1876. 25,612. Made by J. & S. Allen, Walpole, Mass. Used in blackfish and pond fisheries.

CUTTYHUNK BASS LINE.

Hand-made, of the best Irish flax. Length, 200 yards. Value, 1882, $1.25. 57,676. U. S. Fish Commission. (C., B. & M.)

FISHING LINES.

Irish flax, special extra quality (9-thread and 12-thread). Length, 200 yards each. Value, 1880, $2.50 and $3. 42,768 and 42,764. U. S. Fish Commission. This is a favorite line for striped-bass fishing.

FISHING LINES.

Braided linen lines. (B, C, D, E, F, G.) Exhibited by William Mills and Son, of New York City.

FISHING LINES.

Linen, braided. B. Length, 50 yards. Value, 1880, $0.75 42,781. U. S. Fish Commission. (C. B. & M.)

COTTON LINES.

FISHING LINES.

Cotton, shroud-laid. Series of sizes from 00 to 12, in 20-feet hanks. Centennial collection, 1876. 25,619. Made by L. Crandall & Co., Ashaway, R. I. Used in sea-fisheries of Southern New England, New York, and Southern States.

FISHING LINES.

Cotton, white, hawser-laid. Seven lines. (Nos. 1 to 7.) Length, 28 fathoms each. Centennial collection, 1876. 25,621. Made by L. Crandall & Co., Ashaway, R. I. Used in sea-fisheries of New York and New Jersey; No. 1 for mackerel hand-lines, other numbers for sea-bass, bluefish, and blackfish hand-lines.

FISHING LINES.

Cotton, white, shroud-laid. Six lines. (Nos. 2 to 7.) Length, 50 feet each. Centennial collection, 1876. 25,620. Made by L. Crandall & Co., Ashaway, R. I. Used for hand-lines and trawl-lines in sea-fisheries of New York and New Jersey.

FISHING LINE.

White cotton, shroud-laid; one ball, No. 1. Value, 1882, $0.30 per pound. 57,675. U. S. Fish Commission. (C., B. & M.) Used by fishermen of New Jersey and Southern States for lay-out or trotlines.

FISHING LINE.

White cotton, shroud-laid; one ball, No. 2. Value, 1882, $0.30 per pound. U. S. Fish Commission. (C. B. & M.) 57,675(*a*). Used by fishermen of New Jersey and Southern States for lay-out or trot lines.

FISHING LINE.

White cotton, shroud-laid; one ball, No. 3. Value, 1882, $0.30 per pound. U. S. Fish Commission. (C. B. & M.) 57,675 (*b*).

FISHING LINE—Continued.

Used by fishermen of New Jersey and Southern States for lay-out or trot lines.

FISHING LINE.

Cotton, blue, shroud-laid. (No. 4.) One line, 25 fathoms. Value, 1882, $3 per dozen. 54,351. Made by M. B. Jackman & Co., Newburyport, Mass. Used for snoods, 3 feet long, on pollock hand-lines.

FISHING LINE.

Cotton, blue, shroud-laid. (No. 5.) Length, 25 fathoms. Value, 1882, $3.60 per dozen. 54,352. Made by M. B. Jackman & Co., Newburyport, Mass. Used for snoods, 3 feet long, on pollock hand-lines.

FISHING LINES.

Cotton, white and oiled, cable-laid and shroud-laid. Assorted sizes. (Nos. 5 to 9.) Centennial collection, 1876. 26,733 to 26,735; 26,739 to 26,744. Made by J. W. Dresser, Castine, Me. Used for mackerel hand-lines. One of the lines is rigged on a cleat and ready for use.

FISHING LINE.

Cotton, blue, shroud-laid. (No. 6.) Length, 25 fathoms. Value, 1882, $4 per dozen. 54,353. Made by M. B. Jackman & Co., Newburyport, Mass. Used for pollock hand-lines, 25 to 75 fathoms long.

FISHING LINES.

Cotton, white. (Superior, No. 6.) One dozen lines, 14 fathoms each. Value, 1882, $1.10 per dozen. 54,395. Made by M. B. Jackman & Co., Newburyport, Mass. Used for mackerel hand-lines, 7 fathoms long.

FISHING LINES.

Cotton, shroud-laid, steam-tarred. (No. 6.) One dozen lines, 14 fathoms each. Value, 1882, $1.25 per dozen. 54,389. Made by M. B. Jackman & Co., Newburyport, Mass. Used for mackerel hand-lines, 7 fathoms long.

FISHING LINES.

Sea Island cotton, white. (No. 6.) One dozen lines, 14 fathoms each. Value, 1882, $1.25 per dozen. 54,392. U. S. Fish Commission. (M. B. J. & Co.) Used in 7-fathom lengths for mackerel hand-lines.

FISHING LINES.

Sea Island cotton, white. (No. 7.) One dozen lines, 14 fathoms each. Value, 1882, $1.35 per dozen. 54,393. U. S. Fish Commission. (M. B. J. & Co.) Used in 7-fathom lengths for mackerel hand-lines.

FISHING LINES.

Cotton, shroud-laid, steam-tarred. (No. 7.) One dozen lines, 14 fathoms each. Value, 1882, $1.35 per dozen. 54,390. Made by M. B. Jackman & Co., Newburyport, Mass. Used for mackerel hand-lines, 7 fathoms long.

FISHING LINES.

Sea Island cotton, white. (No. 8.) One dozen lines, 14 fathoms each. Value, 1882, $1.50 per dozen. 54,394. U. S. Fish Commission. (M. B. J. & Co.) Used in 7-fathom lengths for mackerel hand-lines.

FISHING LINES.

Cotton, shroud-laid, steam-tarred. (No. 8.) One dozen lines, 14 fathoms each. Value, 1882, $1.50 per dozen. 54,391. Made by M. B. Jackman & Co., Newburyport, Mass. Used for mackerel hand-lines, 7 fathoms long.

FISHING LINES.

Cotton, white, hawser-laid. Five lines. (Nos. 8 to 12.) Length, 14 fathoms each. Centennial collection, 1876. 25,622. Made by L. Crandall & Co., Ashaway, R. I. Used on the coasts of New York and New Jersey for hand-lines, in sea fisheries.

FISHING LINES.

Cotton, shroud-laid, tarred. Two lines. (Nos. 10 and 12.) Length, 25 fathoms each. Centennial collection, 1876. 25,624. Made by L. Crandall & Co., Ashaway, R. I. Used on southern coast of New England for hand-lines in general fisheries for cod, &c.

FISHING LINES.

Cotton, white, shroud-laid. Four lines. (Nos. 10 to 13.) Length, 50 feet each. Centennial collection, 1876. 25,623. Made by L. Crandall & Co., Ashaway, R. I. Used for hand-lines in sea-fisheries on southern coast of New England.

FISHING LINE.

Cotton, white, shroud-laid. (24-thread.) Length, 50 fathoms. Weight, 24 ounces. Value, 1882, $0.35 per pound. 54,372. Made by H. & G. W. Lord, Boston, Mass. Generally tarred by the fishermen for haddock trawl-gangings.

FISHING LINE.

Cotton, white, shroud-laid. (27-thread.) Length, 50 fathoms. Weight, 30 ounces. Value, 1882, $0.35 per pound. 54,350. Made by H. & G. W. Lord, Boston, Mass. Used for haddock trawl-gangings, 27 inches long, and for knitting mackerel dip-nets.

FISHING LINE.

Cotton, shroud-laid, tanned. (30-thread). Length, 25 fathoms. Weight, 9 ounces. Value, 1882, $0.38 per pound. 54,349. Made by M. B. Jackman & Co., Newburyport, Mass. Used for cod trawl-gangings 3 feet long, and haddock trawl-gangings 27 inches long.

FISHING LINES.

Cotton, white, shroud-laid. Centennial collection, 1876. 25,636. Bradford & Anthony, Boston, Mass.

FISHING-LINES.

Cotton, braided; assorted sizes. Centennial collection, 1876. 25,625. Made by G. H. Mansfield & Co., Canton, Mass. For anglers' use in sea-fisheries.

FISHING-LINE.

Cotton, shroud-laid, steam-tarred. (4-pound.) Length, 25 fathoms. Weight, 4 pounds to dozen lines. Value, 1882, $1.25 per dozen. 54,358. Made by M. B. Jackman & Co., Newburyport, Mass. Used for haddock trawl-gangings, 27 inches long.

FISHING-LINE.

Cotton, white, shroud-laid. (4-pound.) Length, 25 fathoms. Weight, 4 pounds to dozen lines. Value, 1882, $1.30 per dozen. 54,373. Made by M. B. Jackman & Co., Newburyport, Mass. Generally tarred by the fishermen for haddock trawl-gangings, 27 inches long.

FISHING-LINE.

Cotton, white, shroud-laid. (5-pound.) Length, 50 fathoms. Weight, 5 pounds to 300 fathoms. Value, 1882, $3.20 per 300 fathoms. 54,374. Made by M. B. Jackman & Co., Newburyport, Mass. Used for cod trawl-gangings, 3 feet long.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (5-pound.) Length, 25 fathoms. Weight, 5 pounds to dozen lines. Value, 1882, $1.40 per dozen. 54,359. Made by M. B. Jackman & Co., Newburyport, Mass. Used for cod trawl-gangings, 3 feet long; and haddock trawl-gangings, 27 inches long.

FISHING LINE.

Cotton, white, shroud-laid. (6-pound.) Length, 25 fathoms. Weight, 6 pounds to 300 fathoms. Value, 1882, $1.80 per 300 fathoms. 54,375. Made by M. B. Jackman & Co., Newburyport, Mass. Used for cod trawl-gangings, 3 feet long; and shore cod hand-lines, 25 to 50 fathoms long.

FISHING LINE.

Cotton, shroud-laid, hard, steam-tarred. (6-pound.) Length, 25 fathoms. Weight, 6 pounds to dozen lines. Value, 1882, $1.60 per dozen. 54,407. Made by M. B. Jackman & Co., Newburyport, Mass. Used for shore cod or pollock hand-lines.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (6-pound.) Length, 25 fathoms. Weight, 6 pounds to dozen lines. Value, 1882, $1.60 per dozen. 54,360. Made by M. B. Jackman & Co., Newburyport, Mass. Used for shore cod trawl-gangings, 3 feet long.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (8-pound.) Length, 25 fathoms. Weight, 8 pounds to dozen lines. Value, 1882, $2 per dozen. 54,361. Made by M. B. Jackman & Co., Newburyport, Mass. Used for shore cod hand-lines, 25 to 75 fathoms long.

FISHING LINE.

Cotton, white, shroud-laid. (9-pound.) Length, 25 fathoms. Weight, 9 pounds to dozen lines. Value, 1882, $2.20 per dozen. 54,376. Made by M. B. Jackman & Co., Newburyport, Mass. Used for shore cod or pollock hand-lines, 25 to 75 fathoms long.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (10-pound.) Length, 25 fathoms. Weight, 12 pounds to dozen lines. Value, 1882, $2.40 per dozen. 54,362. Made by M. B. Jackman & Co., Newburyport, Mass. Little sold now, but formerly used for shore cod hand-lines, 25 to 75 fathoms long; halibut trawl-gangings, 5 feet long; and haddock trawl ground-lines, 1 to 3 miles long in sections or "tubs" of 1,750 feet.

FISHING LINE.

Cotton, white, shroud-laid. (12-pound.) Length, 25 fathoms. Weight, 12 pounds to dozen lines. Value, 1882, $2.50 per dozen. 54,377. Made by M. B. Jackman & Co., Newburyport, Mass. Used for shore cod hand-lines, 25 to 75 fathoms long. Tarred by fishermen for shore cod trawl ground-lines, 500 to 2,000 fathoms long, in "tubs" of 250 fathoms.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (12-pound.) Length, 25 fathoms. Weight, 12 pounds to dozen lines. Value, 1882, $2.80 per dozen. 54,363. Made by M. B. Jackman & Co., Newburyport, Mass. Used for bank dory cod hand-lines, 25 to 75 fathoms long.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (14-pound.) Length, 25 fathoms. Weight 14 pounds to dozen lines. Value, 1882, $3.15 per dozen. 54,364. Made by M. B. Jackman & Co., Newburyport, Mass. Used for halibut trawl-gangings, 5 feet long; and haddock trawl ground-lines, in "tubs" of 1,750 feet.

FISHING LINE.

Cotton, white, shroud-laid. (15-pound.) Length, 25 fathoms. Weight, 15 pounds to dozen lines. Value, 1882, $3 per dozen. 54,378. Made by M. B. Jackman, & Co., Newburyport, Mass. Used for shore cod and haddock trawl ground-lines, in "tubs" of 250 fathoms each; also for shore or bank cod hand-lines, 25 to 75 fathoms long.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (16-pound.) Hard-laid and heavily tarred. Length, 25 fathoms. Weight, 16 pounds to dozen lines. Value, 1882, $3.50 per dozen. 54,365. Made by M. B. Jackman & Co., Newburyport, Mass. Used especially for George's cod hand-lines, 150 fathoms long.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (16-pound.) Length, 25 fathoms. Weight, 16 pounds to dozen lines. Value, 1882, $3.50 per dozen. 54,366. Made by M. B. Jackman, & Co., Newburyport, Mass. Used for haddock trawl ground-lines, 1 to 3 miles long, in "tubs" of 1,750 feet; and halibut trawl-gangings, 5 feet long.

FISHING LINE.

Cotton, white, shroud-laid. (18-pound.) Length, 25 fathoms. Weight, 18 pounds to dozen lines. Value, 1882, $3.85 per dozen. 54,379. Made by M. B. Jackman & Co., Newburyport, Mass. Used for bank cod trawl ground-lines, 1,000 to 2,000 fathoms long, in "tubs" of 250 to 500 fathoms.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (18-pound.) Length, 25 fathoms. Weight, 18 pounds to dozen lines. Value, 1882, $3.75

FISHING LINE—Continued.

per dozen. 54,367. Made by M. B. Jackman & Co., Newburyport, Mass. Used for cod trawl ground-lines, 1,000 to 2,000 fathoms long, in "tubs" of 250 to 500 fathoms; and haddock trawl ground-lines, 1 to 3 miles long, in "tubs" of 1,750 feet.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (20-pound.) Length, 25 fathoms. Weight, 20 pounds to dozen lines. Value, 1882, $4.20 per dozen. 54,368. Made by M. B. Jackman & Co., Newbury-Mass. Used for cod trawl ground-lines, 1,000 to 2,000 fathoms long, in "tubs" of 250 to 500 fathoms.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (24-pound.) Length, 25 fathoms. Weight, 24 pounds to dozen lines. Value, 1882, $4.75 per dozen. 54,369. Made by M. B. Jackman & Co., Newburyport, Mass. Used in shoal water, less than 100 fathoms, for halibut trawl ground-lines, 1,500 fathoms long, in "skates" of 375 fathoms.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (28-pound.) Length, 25 fathoms. Weight, 28 pounds to dozen lines. Value, 1882, $5.25 per dozen. 54,370. Made by M. B. Jackman & Co., Newburyport, Mass. Used in shoal water, less than 100 fathoms, for halibut trawl ground-lines, 1,500 fathoms long, in "skates" of 375 fathoms.

FISHING LINE.

Cotton, shroud-laid, steam-tarred. (32-pound.) Length, 50 fathoms. Weight, 32 pounds to 300 fathoms. Value, 1882, $6.40 per 300 fathoms. 54,371. Made by M. B. Jackman & Co., Newburyport, Mass. The most common line at Gloucester for halibut trawl ground-lines, 1,500 fathoms long, in "skates" of 375 fathoms. Used in water from 100 to 300 fathoms deep.

FISHING LINES.

Exhibit of fishing-lines manufactured by Castine Cordage Company, Castine, Me., including cotton fishing-lines used in the capture of cod and mackerel, several grades of hand-lines and trawl-lines. J. W. Dresser, Castine, Me., president.

HEMP LINES.

FISHING LINE.

Hemp. (6-thread.) Length, 25 fathoms. Value, 1882, $3 per dozen. 54,404. U. S. Fish Commission. Used in 3-feet lengths for cod trawl-gangings.

FISHING LINE.

Hemp. (9-thread.) Length 25 fathoms. Value, 1882, $3.25 per dozen. 54,405. U. S. Fish Commission. Used in 3-feet lengths for cod trawl-gangings.

FISHING LINE.

Hemp. (12-thread.) Length, 25 fathoms. Value, 1882, $4 per dozen. 54,406. U. S. Fish Commission. Used for cod hand-lines and in 3-feet lengths for cod trawl-gangings.

FISHING LINE.

Hemp. (18-thread.) Length, 25 fathoms. Value, 1882, $6 per dozen. 54,356. U. S. Fish Commission. Used for hook-gangings, 10 inches long, on George's cod hand-lines.

HEMP SALMON TWINE.

One ball; weight, 2 pounds. Value, 1882, $0.55 per pound. 54,380. U. S. Fish Commission. Used for serving spreaders and horses, and seizing swivels on hand-lines; for seizings on trawl-buoys, and other uses.

SAIL-TWINE.

Hemp, one skein. Value, 1882, $0.15 per skein. 54,400. U. S. Fish Commission. Used for seizing halibut trawl-hooks on the gangings, for mending sails, rigging hand-line gear, and other general uses.

FISHING-LINE.

Hemp, two-strand. One hundred lengths, 3 feet each. Value, 1882, $0.50 per 100. 54,354. U. S. Fish Commission. Used for shore cod hand-line gangings, and for shore trawl-gangings.

MANILA LINES.

BUOY-LINE.

Manila, tarred, six-thread, one coil; weight, 20 pounds. Value, 1882, $0.17½ per pound. U. S. Fish Commission (S. D. & Co.). 54,409. Used for buoy-lines on cod, haddock, and halibut trawls.

BUOY-LINE.

Manila, six-thread, one coil; weight, 26½ pounds. Value, 1882. $0.17½ per pound. U. S. Fish Commission (S. D. & Co.). 54,411. Commonly used for buoy-lines on cod, haddock, and halibut trawls.

BUOY-LINE.

Manila, nine-thread, one coil; weight, 42 pounds. Value, 1882, $0.17½ per pound. U. S. Fish Commission (S. D. & Co.).

BUOY-LINE—Continued.

54,410. Used for buoy-lines on halibut trawls, for warps to lobster traps, and for boat-anchor warps.

LOBSTER-TWINE.

Manila lobster-twine. One ball, 4¾ pounds. Value, 1882, 24 cents per pound. 54,399. U. S. Fish Commission. For lobster trap-heads; for halibut trawl-beckets to fasten gangings to ground-line; for seizings, etc.

ROOT AND BARK LINES.

TOW-LINE.

Small tow-line. Makah name "Les-tope." Made of fibers of spruce roots; used by natives for towing the whale ashore. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,633. James G. Swan.

TOW-LINE.

Small size; Indian name "Les-tope." Made of spruce roots (*Abies Douglasii*). The process of manufacture consists in (1) roasting the material in hot ashes; (2) splitting with knives into fine fibers, and (3) twisting the fibers into a rope. Durable and strong. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,631. James G. Swan. Used by natives in towing whales ashore.

TOW-LINE.

New, large size. Made of fibers of spruce roots (*Abies Douglasii*). The long slender roots are first roasted in the ashes, then split into fine strands with knives, twisted, and laid up into ropes by hand. These ropes are beautifully made, exceedingly strong and buoyant. The Indians not only understand the art of rope-making by hand as well as the whites, but they can also "knot" and "graft" a rope as well as white sailors. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,632. James G. Swan. Used by natives for towing whales ashore.

BARK.

Inner bark of white cypress (*Cupressus nukatensis*), from which the twine used in whaling, as well as soft beds for infants, is manufactured. Small package; length, 5 inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,641. James G. Swan. When a harpoon with one buoy attached has been darted into a whale, another buoy is immediately attached to the lanyard of the first, the operation being repeated until a sufficient number of buoys have been *bent on*. It is often necessary to detach some of the buoys to make them fast to others. The

BARK—Continued.

twine made from cypress bark is well adapted for this purpose, as it breaks easily when wet, and quickly releases the buoys, which would not be the case with other kinds of twine.

GRASS LINES.

FISHING LINES.

Grass, relaid. Assorted sizes. Centennial collection, 1876. 25,635. Bradford & Anthony, Boston, Mass. Used chiefly by anglers in Western States.

FISHING LINES.

Grass, cable-laid and shroud-laid. (Nos. 0, 1, and 3.) Centennial collection, 1876. 25,634. Bradford & Anthony, Boston, Mass. Used chiefly by anglers in Western States.

GUT LINES.

[See also gut leaders, snoods, and traces attached to fish-hooks.]

SPANISH SILK-WORM GUT.

For salmon, trout, and bass leaders. 42,829 to 42,835.

GUT LEADERS.

Single, double, and twisted leaders; 3, 6, and 9 feet long. For salmon, trout, and bass fishing. William Mills & Son. 56,995 to 57,001.

GUT LEADERS.

Single, double, and twisted leaders; 3, 6, and 9 feet long. For salmon, trout, and bass fishing. U. S. Fish Commission. (C., B. & M.) 42,872.

GUT LINES.

Samples of Foster's transparent gimp gut. Exhibited by C. Recht, New York City.

HIDE LINES.

FLOAT-LINE.

Line make of walrus-hide, used in the capture of walrus and whales, for attaching buoys. Sledge Island, Alaska, 1880. 45,403. Collected by E. W. Nelson.

FLOAT-LINE.

A line made of seal-skin, used by natives when capturing the beluga, for bending on buoys. Cape Darby, Alaska. 48,106. Collected by E. W. Nelson.

LINE (Puh-noch-pak).

Made of braided sinew, decorated with tufts of red and blue worsted and long seal hair. Has an eye in one end, the other end being

LINE—Continued.

double. Is attached to seal spear. Length, 80 feet. Bristol Bay, Alaska, 1882. 72,490. Collected by William J. Fisher. Nushagagmut Eskimo, Nushagak River.

SINKERS.

HAND-LINE SINKERS.

LEAD SINKERS.

For hand-lines used in pond and sea fisheries; cod-line sinker, style of 1840, with soapstone mold. Patent adjustable. For pond fishing. 39,428 (a). 39,428 (b). 39,428 (c). 39,428 (d). For tautog fishing. 57,564. Southern New England pattern. 25,607. Rhode Island pattern, for cod and tautog. 25,605.

TAUTOG DOUBLE SINKERS.—Rhode Island pattern. 54,511.

LEAD SINKER, WITH SPRING STOCK.—For bluefish line. 54,336.

MOLD AND SINKER FOR COD-LINE.

(Pattern of 1840.) Soapstone mold in two parts; globe-shape inside; sinker with iron stock. Gloucester, Mass. 54,510. U. S. Fish Commission. Style of sinker used on shore cod hand-lines at Cape Ann in 1840.

HAND-LINE SINKER.

Lothrop's improved pattern for George's hand-lines. Made of lead, with brass bumper on the foot. Weight, 9 pounds. Gloucester, Mass., 1880. 54,489. U. S. Fish Commission.

SINKER FOR COD HAND-LINE. Cape Ann pattern. 57,556.

COD-LINE SINKERS. Cape Cod patterns. 25,716.

SINKERS.

Samples of "The connecting sinker or fish-hook holder." A contrivance "that can be used for the double purpose of connecting or disconnecting, in a twinkling, the hook, catgut, or snell with the line, and also serving as a sinker at the same time, thereby having the great advantage of avoiding the trouble and annoyance of tying and untying the string on and off the hook, &c." Prices for 1883: No. 1 (smallest size), $3.50 per dozen; No. 2 (middle size), $4 per dozen; No. 3 (largest size), $4.50 per dozen. Exhibited by Van Altena & Scheltus, Milwaukee, Wis.

STONE SINKER FOR HALIBUT-LINE.

Used by Makah Indians. Length, 10 inches. Port Townsend, Washington Territory, 1883. 72,659. James G. Swan.

HAND-LINE TAIL-STOCK.

Made of galvanized iron, with eye at upper end. Length, 13½ inches. Gloucester, Mass., 1880. 54,492. U. S. Fish Commission. Used in upper end of George's Bank hand-line lead sinker.

HAND-LINE TAIL-STOCK.

Made of brass, with eye at each end. Length, 4¼ inches. Gloucester, Mass., 1882. 54,497. U. S. Fish Commission. Used in lead sinkers of shore cod hand-lines.

HAND-LINE HORSE.

Made by a fisherman on shipboard. Piece of manila rope 15 inches long, served with twine; outer end also served with canvas and inner end with leather. Gloucester, Mass., 1882. 39,183. U. S. Fish Commission. Used in lead sinker of George's Bank cod hand-line.

HAND-LINE HORSE.

Made of white oak with brass snood-swivel at outer end. Length, 18 inches. Gloucester, Mass., 1882. 54,491. U. S. Fish Commission. Used in lead sinker of George's Bank cod hand-lines.

HORSE AND BUMPER.

Made of brass, with swivel at outer end. Gloucester, Mass., 1882. 54,498. U. S. Fish Commission. Used in lead sinkers of shore cod hand-lines.

HAND-LINE BUMPER.

Made of brass, unpolished, oval shape. Gloucester, Mass., 1882. 54,496. U. S. Fish Commission. These bumpers are molded into the foot of George's Bank hand-line sinkers to protect them when banged against rocky bottom.

SET-LINE SINKERS.

TRAWL-KILLICK.

E. N. Twiss's patent, April, 1878. Cast-iron: two pieces of iron with chisel-shaped ends crossing each other at right angles, and attached to bottom of an iron shank. Length of flukes, 7½ inches, 1½ inches thick; shank, 10 inches long. 32,651. Used for anchoring fishing-gear.

UNDER-RUNNING ROCK.

Rough, oblong, flat piece of granite, around which is tied a piece of fishing-line 4 feet long. Length of stone, 8½ inches; width, 6 inches. Cape Ann, Mass., 1882. 54,346. U. S. Fish Commission. Used to sink end of trawl-line when the latter is set for under-running.

UNDER-RUNNING ROCK.

An oval-shaped beach stone (6 inches by 5 inches), having a hole in one end, into which is driven a wooden peg. A short piece of fishing-line is fastened to the stick. Cape Ann, Mass., 1883. 54,346 (*a*). A. Howard Clark. Used for the purpose of sinking the end of a trawl-line which is set for under-running.

TRAWL-ANCHORS. (For descriptions see Sec. I.)

IRON KILLICKS. (For descriptions see Sec. I.)

VOSS'S IMPROVED SELF-STOCKING ANCHOR. (See Sec. I, p. 111.)

NET-SINKERS

NET-SINKERS.

Old-style lead sinkers for nets. Wellfleet, Mass. 29,474. Gift of Newell B. Rich.

MENHADEN-NET SINKERS.

Old-style flat rings made of lead. Beverly, Mass., 1876. 25,800. Gift of G. B. Foster. Formerly used at Beverly and vicinity on the foot of menhaden seines.

NET-SINKERS.

Samples of large and small lead rings used as net-sinkers. Wilcox, Crittenden & Co. 29,393; 25,394.

STONE KILLICKS. (For descriptions see Sec. I.)

GRAPPLING-ANCHOR. (For description see Sec. I.)

SWIVELS.

LINE SWIVELS.

SWIVELS.

Series of brass, horn, and iron swivels, used on hand-lines, nets, and trawls. Old and new patterns.

HAND-LINE SWIVELS.

For cod and pollock lines.

HORN COD-LINE SWIVEL.

Formerly much used by Grand and George's Banks fishermen. 25,798.

HORSE-SWIVEL.

Used on cod-line. 29,392. Lothrop's patent. For cod hand-line. 32,659.

SHARK-HOOK SWIVEL. 29,457.

COD GANGING AND SWIVEL. Showing mode of fastening. 29,486.

HAND-LINE SWIVEL. (Old style.)

Made of horn about the year 1800. Length, 2 inches. Gloucester, Mass. 39,178. Gift of L. D. Lothrop. This style of swivel was in use for many years on cod hand-lines.

HAND-LINE SWIVELS.

For pond fishing. 39,428.

HAND-LINE SLING-DING.

Made of galvanized-iron wire, with eye at each end. Length, 21 inches. Gloucester, Mass., 1882. 54,493. U. S. Fish Commission. Used as a spreader on George's Bank cod hand-lines.

HAND-LINE SWIVELS.

Made of brass; snood swivel for end of horse, and slot swivel for lower end of snood. Gloucester, Mass., 1882. 54,494. U. S. Fish Commission. Used on George's Bank cod hand-lines. The hook-ganging fits in opening of slot-swivel.

SLOT-SWIVELS.

Used for hook-gangings on cod-lines. Latest pattern. 56,952–3.

TRAWL-BUOY SWIVELS.

TRAWL-BUOY SWIVELS.

Old style. 29,395. Cape Cod pattern. 25,946. Socket for staff. 25,187. Old style, Gloucester pattern. 32,694. Gloucester patterns. 29,498; 32,713; 56,951.

HALIBUT TRAWL-BUOY SWIVEL.—Cape Cod pattern. 29,476.

NET-SWIVELS.

TRIPPLE NET-SWIVEL.

For cod gill-nets to connect the buoy-line and under-running line. 54,495.

FLOATS.

LINE-FLOATS OF WOOD AND QUILL.

LINE-FLOATS.

Series of egg-shaped wooden floats with wood and quill tops; patent adjustable floats; for pond fishing. 25,661; 39,428; 42,874.

LINE-FLOATS.

Series of barrel-shaped wooden floats with wood and quill tops; patent adjustable floats; snake-head and quill floats; used in pond fishing. 25,662; 39,428; 42,874.

HARPOON-FLOATS OF INFLATED SEAL-SKIN.

SEAL-SKIN BUOY.

Skin of hair seal used by natives in the capture of the whale. Indian name "Do-ko-kuptl." Old; not inflated. Length, 34 inches. Makah Indians, Cape Flattery, Washington Territory. 72,751. James G. Swan.

SEAL-SKIN BUOY.

Skin of hair seal. Small stationary wooden toggle at either end for holding eye-splice of harpoon-line. Small lanyards made of fibers of spruce roots for "making fast" to other buoys. Indian name "Do-ko-kuptl." Length, 38 inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,630. James G. Swan.

"This form of buoy is simply a seal-skin taken from the animal whole, the hair being left inwards. The apertures of the head, feet, and tail are tied up air-tight and the skin inflated like a bladder."—"Indians of Cape Flattery."

Inflated and attached to the harpoon, showing the manner in which the apparatus is used during the capture. A number of buoys being made fast to the whale prevents its progressive motions, thus affording the natives an opportunity to kill it with a lance. 72,674.

SEAL-SKIN BUOY.

Skin of the hair seal, used by natives in the capture of the whale. Indian name "Do-ko-kuptl." New; not inflated. Length, 36 inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,629. James G. Swan.

SEAL-SKIN BUOY.

Skin of a small seal turned inside out; the apertures of head and feet are tied up or hermetically fastened by means of small bone studs, with the exception of one of the forelegs, which is used for inflation, the hole being stopped by a wooden plug. A grommet, through which the buoy-line is rove, is seized to the neck. Size, 26 by 15 inches. Bristol Bay, Alaska, 1882. 72,400. Collected by Charles L. McKay.

SEAL-SKIN BUOY.

Skin of a small seal turned inside out; the apertures of head and feet are tied up or hermetically fastened by means of small bone studs, with the exception of one of the forelegs, which is used for inflation, the hole being stopped by a wooden plug. A grommet, through which the buoy-line is rove, is seized to the neck. Size, 24 by 15 inches. Bristol Bay, Alaska, 1882. 72,399. Collected by Charles L. McKay.

SEAL-SKIN BUOY.

Stuffed; ornamented with ivory pendants and feathers. Flippers attached. North Greenland. 19,515. G. Y. Nickerson.

TRAWL AND NET FLOATS OF METAL, CORK, WOOD, AND GLASS.

CAMEL'S-BACK BUOY.

Made of tin, in two sections, soldered together; ring at each end. Length, 12 inches; diameter, 9 inches. Kelley's Island, Ohio. 57,030. Gift of Charles Carpenter.

NET-BUOY.

Cork floats lashed around a staff. Swivel and rope strap at end of staff. Rockport, Mass., 1883. 57,145. U. S. Fish Commission.

GLASS FLOAT.

Partly filled with water by being sent down in the mouth of a beam-trawl to the depth of 787 fathoms in Lat. 39° 59′ 45″ N., Lon. 68° 54′ W., during a dredging trip of the U. S. Fish Commission steamer Fish Hawk in the summer of 1882. Washington, D. C., 1883. 57,093. Gift of James A. Smith, U. S. N.

TRAWL-BUOY.

Five glass balls, each 18 inches in circumference, covered with netting, and lashed around a series of cork floats strung on a staff. Swivel and rope strap at end of staff. Rockport, Mass., 1883. 57,144. U. S. Fish Commission.

REELS.

SIMPLE REELS FOR FLY-FISHING, WITH AND WITHOUT CLICK.

FISHING REEL.

Hard rubber. German-silver rim; plate; click. Capacity, 100 yards. Value, 1882, $6.50. 25,569. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Hard rubber. German-silver band; plate; click. With leather case. Capacity, 60 yards. Value, 1882, $10. 25,577. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Hard rubber. German-silver mounted; plate; balance handle; click. Capacity, 300 yards. Value, 1882, $20. 39,245. U. S. Fish Commission. (A. & I.)

FISHING REEL.

Hard rubber and German-silver. German-silver band; plate; balance handle; click and rubber sliding drag. Capacity, 300

FISHING-REEL—Continued.

yards. Value, 1882, $30. 42,813. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

Hard rubber and German-silver; plate; click. Capacity, 80 yards. Value, 1882, $12. 42,814. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

Hard rubber and brass; plate; click. Capacity, 15 yards. Value, 1882, $2.50. 42,825. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

(Winans & Whistler patent.) Hard rubber and brass, silver-plated. Complete with 250 yards of line. Secured by plate and rivet. Balance-handle. Value, 1882, $40. 42,827. U. S. Fish Commission. Adjustable spring guide or line-eye checks overrunning of the line by preventing rotation of reel when casting. Slotted, hinged cover, guides and controls flow of line; and thumb brake controls rotation of reel when playing fish. (C., B. & M.)

FISHING REEL.

Hard rubber; plate; click. Capacity, 25 yards. Value, 1882, $5.50. 42,820. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

(Fowler's patent.) Hard rubber, perforated, with plate. Capacity, 80 yards. Value, 1882, $2.50. 25,581. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Hard rubber, plain rim; plate; click. Capacity, 40 yards. Value, 1882, $2.00. 25,571. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Celluloid; plate; click. Capacity, 80 yards. Value, 1882, $3.50. 25,579. U. S. Fish Commission. (B. & A.)

FISHING REEL.

German silver and rubber; raised pillar; capped click. Balance-handle. Capacity, 120 yards. Value, 1882, $35. 57,671. U. S. Fish Commission. (C. & B.)

FISHING REEL.

(Orvis's patent.) German-silver, nickel plated; plate and click. Capacity, 50 yards. Value, 1882, $3.50. 54,281. Gift of Bradford & Anthony, Boston, Mass.

FISHING REEL.

German silver; plate; capped; click. Capacity, 40 yards. Value, 1882, $5. 42,823. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

German silver; plate; secret click. Capacity, 40 yards. Value, 1882, $5. 42,822. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

German silver, with plate; click. Capacity, 60 yards. Value, 1882, $3.38. 25,666. U. S. Fish Commission. (B. & A.)

FISHING REEL.

(Orvis's patent.) German-silver, nickel plated. Perforated for lightness, and to keep it free from sand, also that line may dry without removal from reel after use. Plate. Capacity, 50 yards. Value, 1882, $3. 25,582. Gift of Bradford & Anthony, Boston, Mass.

FISHING REEL.

German-silver, with plate; click, with rim. Capacity, 40 yards. Value, 1882, $3. 25,575. U. S. Fish Commission. (B. &. A.)

FISHING REEL.

German-silver; plate; click. Capacity, 150 yards. Value, 1882, $6.50. 25,565. U. S. Fish Commission. (B. & A.)

FISHING REEL.

German-silver; plate; click. Capacity, 300 yards. Value, 1882, $18. 25,564. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Ebonite, German-silver mounted; plate; click. Capacity, 30 yards. Value, 1882, $8. 39,432. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Ebonite, German-silver mounted; plate; click. Capacity, 40 yards. Value, 1882, $10. 39,431. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Ebonite, German-silver mounted; plate; balance-handle; click. Capacity, 80 yards. Value, 1882, $12. 39,430. U. S. Fish Commission. (B. & A.)

FISHING REEL.

(Chubb's patent.) Nickel-plated; click; riveted plates. Value, 1882, $1.50. 57,687. U. S. Fish Commission. (A. C. S.)

FISHING REEL.

(Billinghurst patent.) Nickel. Value, 1883, $3. 56,993. Wm. Mills & Son, New York City.

FISHING REEL.

Brass, unburnished, with plate. Capacity, 30 yards. Value, 1882, $0.60. 25,589. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Brass, unburnished, with ring; single. Capacity, 15 yards. Value, 1882, $0.60. 25,590. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Brass, unburnished, with plate; single, with stop. Capacity, 15 yards. Value, 1882, $0.60. 25,588. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Brass, unburnished; plate; click. Capacity, 15 yards. Value, 1882, $0.70. 25,586. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Brass, unburnished; ring; click. Capacity, 40 yards. Value, 1882, $1. 25,585. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Brass, burnished, with ring; single. Capacity, 40 yards. Value, 1882, $0.75. 25,587. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Smith's patent. Brass; automatic. Capacity, 30 yards. Value, 1882, $6. 57,685. U. S. Fish Commission. (A. C. S.)

FISHING REEL.

Brass, with raised pillars; plate; click. Capacity, 399 yards. Value, 1882, $4. 25,888. U. S. Fish Commission. (A. & B.)

FISHING REEL.

Leonard's patent, 1877. Polished metal; trout click; steel click wheels secured to bridge inside of plate. Diameter, 2¼ inches; weight, 3½ ounces; capacity, 40 yards. Value, 1882, $8. 57,994. Wm. Mills & Son, New York City. Special exhibit.

FISHING REEL.

Iron with plate. Capacity, 80 yards. Value, 1882, $0.25. 42,826. U. S. Fish Commission. (C., B. & M.)

AUTOMATIC REELS.

Bronze-plated automatic reel No. 1, capable of holding 90 feet of line. Nickle-plated automatic reel No. 2, capable of holding 150 feet of line. Manufactured and exhibited by Loomis, Plumb & Co., Syracuse, N. Y.

MILAM OR FRANFORT FISHING REEL.

A combined multiplying and click reel used for either bait or fly fishing, and multiplies four times. "The friction of the parts is so slight that a smart stroke of the handle causes it to make about fifty revolutions. For bait fishing the reel is used clear, with alarm and rubber both off, and, with a little practice, one can drop his bait at any desired spot within 50 or 60 yards with ease. For fly fishing the rubber or drag is put on, and if you desire a click also, the alarm or click is used. These improvements can be used separate or together as desired. We wish to call special attention to these important adjuncts, and have their use fully understood, for with their aid you can make a multiplying or click reel at pleasure, thus rendering the 'Frankfort' doubly valuable. They are operated by sliding disks on side of reel, and do not in the least complicate its working. Made in brass and German silver in six sizes, costing from $13 to $26 each."—(*Milam.*) Exhibited by B. C. Milam, Frankfort, Ky.

FISHING REELS.

Salmon reels: Leonard's patent.
Trout reels: Leonard's patent.
Salmon reels. (William Mills & Son's new patent.)
Trout reels. (William Mills & Son's new patent.)
Multiplying reels: (B. H.) adjustable click, three sizes, 2, 3, and 4, in rubber and German silver.
Leonard's click reel.
Billinghurst reel. Exhibited by William Mills & Son, of New York City, and entered for competition.

FISHING REELS.

Salmon reel; one sample.
Trout reel; one sample.
Bass reels; two samples. Exhibited by William Mitchell, of New York City, and entered for competition.

FISHING REELS.

70-yard balance sliding click reel.
250-yard Fairmount click reel.
300-yard balance handle, steel pivots, &c. Exhibited by A. B. Shipley & Sons, of Philadelphia, Pa.

MULTIPLYING REELS FOR FLY-FISHING WITH AND WITHOUT CLICK.

FISHING REEL.

Hard rubber, with plate; balance handle; multiplying. Capacity, 60 yards. Value, 1882, $8. 25,570. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Hard rubber and German-silver; balance handle, steel pivot; multiplying. Capacity, 300 yards. Value, 1882, $35. 42,815. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

Hard rubber, German silver bands and black bars, with plate; balance handle; combined multiplying and click with rubber sliding drag-plate. Capacity, 40 yards. Value, 1882, $11. 42,821. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

German silver and rubber; multiplying; steel pivot, balance handle. Value, 1882, $25.50. 57,688. U. S. Fish Commission. (A. C. S.)

FISHING REEL.

German silver, with plate; balance handle; steel pivot; multiplying. Capacity, 200 yards. Value, 1882, $8. 42,817. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

German silver, with plate; balance handle, steel pivot; multiplying. Capacity, 200 yards. Value, 1882, $16. 42,816. U. S. Fish Commission. (C., B. & M.)

FRANKFORT REEL.

German silver, with plate; balance handle; multiplying. Capacity, 15 yards. Value, 1882, $3. 39,236. Gift of B. C. Milam, Frankfort, Ky.

FISHING REEL.

German silver, with plate; balance handle; multiplying. Capacity, 25 yards. Value, 1882, $3.50. 25,574. U. S. Fish Commission. (B. & A.)

FISHING REEL.

German silver, with plate; balance handle; steel pivot; multiplying, with drag. Capacity, 300 yards. Value, 1882, $9. 25,572. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Celluloid, with plate; balance handle; multiplying, with click. Capacity, 150 yards. Value, 1882, $9. 25,580. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Celluloid, plate; balance handle; multiplying, with click and extra spool. Capacity, 80 yards. Value, 1882, $15. 25,578. U. S. Fish Commission. (B. & A.)

FISHING REEL. (Malleson's patent.)

Nickel; multiplying; central action; adjustable click; balance handle. Value, 1882, $7. 57,689. U. S. Fish Commission. (A. C. S.) Same as No. 57,672.

FISHING REEL.

Nickel-plated, with plate; balance handle; quadruple multiplying. Capacity, 25 yards. Value, 1882, $5.25. 43,824. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

Brass, with plate; balance handle; multiplying. Capacity, 40 yards. Value, 1882, $3. 42,819. U. S. Fish Commission. (C., B. & M.)

FISHING REEL.

Brass, bushed and polished, with plate; multiplying, with stop. Capacity, 15 yards. Value, 1882, $1.10. 25,584. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Brass, bushed and polished, with ring; multiplying, with stop. Capacity, 50 yards. Value, 1882, $1.60. 25,583. U. S. Fish Commission. (B. & A.)

FISHING REEL.

Brass, bushed and polished, with plate; multiplying, with drag. Capacity, 60 yards. Value, 1882, $2.50. 25,573. U. S. Fish Commission. (B. & A.)

FISHING REEL. (Patent perfection.)

Multiplying; central action; adjustable click; balance handle. Value, 1882, $7. 57,672. U. S. Fish Commission. (C. & B.)

GUNWALE AND DECK WINCHES.

TRAWL-LINE ROLLER AND EYE-PLATE.

Roller of lignum-vitæ wood, with single groove for trawl-line. Eye-plate of galvanized iron fastens on gunwale of boat. Width

TRAWL-LINE ROLLER AND EYE-PLATE—Continued.

of roller, 2 inches; diameter, 3¾ inches. Shank, 8 inches long. Length of eye-plate, 5 inches. Provincetown, Mass., 1875. 24,488. Gift of Amasa Taylor. This was the first style of trawl-roller used at Provincetown.

TRAWL-LINE ROLLER.

Roller of lignum-vitæ wood with three grooves. Iron shank. (McDonald's patent, 1875.) Gloucester, Mass., 1880. 54,552. Gift of A. R. Crittenden, Middletown, Conn. Much worn by constant use. One of the common styles for bank cod and halibut fishing.

TRAWL-LINE ROLLER.

Roller of lignum-vitæ wood with three grooves. Iron shank. Width of roller, 6 inches; diameter, 4 inches. Gloucester, Mass., 1880. 54,551. Gift of A. R. Crittenden, Middletown, Conn. This roller was deeply worn in the center groove, which is reinforced with leather. Two side grooves were then rudely cut, and thus gave the idea for the patent three-groove roller.

IMPROVED WINDER OR WINDLASS.

For use on oyster-dredging vessels. U. S. Fish Commission. 57,092. The apparatus is specially arranged to prevent injuries to those working it by violent movements of the handles due to sudden strains on the dredge-line.

PATENT ROLLER-BUSHING.

Made of brass. Used in tackle-blocks and trawl-rollers. Middletown, Conn. 57,555. Wilcox, Crittenden & Co.

DORY ROLLER FOR COD GILL-NETS.

Hard wood, round, iron bands at ends, with iron pintles to fit in dory gunwales. Length of roller 6½ feet, diameter of ends 3¼ inches; length of pintles 9 inches. Gloucester, Mass., 1883. 57,826. U. S. Fish Commission. Used in cod gill-net fishery.

IMPROVED TRAWL ROLLER.

The improvement consists in having the spindle securely fastened to the roll, and having the outer ends revolve in a box at each end of the roll. The box is made of composition, and provided with a lubricant for the spindle to run in. Exhibited by Bagnall & Loud, Boston, Mass.

LINE-HOLDERS.

HOOK, LINE, AND SPEAR-HEAD HOLDERS.

ESKIMO LINE-HOLDER.

A wooden rack, painted white. Used by natives when beluga fishing, for carrying the line, buoy, &c. When in use it is placed on the deck of the kyak in front of the hunter. Size, 43 by 14½ inches. Bristol Bay, Alaska, 1882. 72,404. Collected by Charles L. McKay.

TRAWL-LINE BASKET.

An egg-shaped basket made of split reeds; handle on each side; strips on bottom. Boston, Mass., 1883. 57,146. U. S. Fish Commission. Used by Irish haddock fishermen of Boston for holding their trawls.

BASKET.

Used to hold spear-heads and other small articles in sealing; called by the Makahs "kla-ash." Length, 19 inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,663. James G. Swan. "A very fine specimen, double; made for a chief and was procured as a special favor. Such baskets are never offered for sale. After having been used they acquire additional value, and to sell one is deemed unlucky. This being new, was more easily obtained."

SMALL BASKET, "KLA-ASH."

Used as a receptable for spear-heads by natives when engaged in killing seal. Dimensions, 15½ inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,664. James G. Swan.

LARGE BASKET, "KLA-ASH."

Used by natives for holding spear-heads, harpoons, and lines when sealing. Length, 28 inches. Makah Indians, Port Townsend, Washington Territory, 1883. 72,665. James G. Swan. "These baskets are never offered for sale. The prices asked for them, when a native is induced to sell, exceed those of the ordinary baskets."

BASKET.

Small "kla-ash" for holding halibut-hooks. Length, 11 inches. Makah Indians, Cape Flattery, Washington Territory, 1883. 72,666. James G. Swan.

GRAPNELS FOR RECOVERING LOST LINES.

DEVIL'S-CLAW GRAPNEL.

Iron, black; a piece of $\frac{3}{8}$-inch chain, 10 or 12 feet long, with 3-prong claw-like grapnels fastened at intervals of 3 feet along its length and one at the extreme end of the chain. Length of each grapnel, 9 inches; each prong, 5 inches. Gloucester, Mass., 1883. 54,342. U. S. Fish Commission. Used for recovering lost trawl-lines, &c.

GRAPPLING-IRON.

Iron, black; four stout recurved hooks joined together on a single shank. Ring at top of shank served with canvas. Length of shank, 7 inches; spread of prongs, 8 inches. Gloucester, Mass. 25,936. Presented by A. McCurdy. Used to recover lost fishing-lines, &c.

FISHING RODS.

PICKEREL ROD.

Common; four pieces. U. S. Fish Commission. (B. &. A.) 25,510.

COMMON ROD.

Three pieces; ash and hornbeam; brass mounting. U. S. Fish Commission. (B. &. A.) 25,511.

COMMON BASS ROD.

Four pieces, brass-mounted. U. S. Fish Commission. (B. & A.) 25,508.

BAIT ROD FOR TROUT.

Four pieces; common. U. S. Fish Commission. (B. & A.) 25,509.

GUDGEON ROD.

Three pieces; ash and hornbeam; brass mounting; common. U. S. Fish Commission. (B. & A.) 25,512.

CHUBB'S BASS ROD.

Double guided, with reversible reel-plate. U. S. Fish Commission. (B. & A.) 39,429.

BLACK-BASS ROD (FLY COMBINATION.)

Three-piece bait and four-piece fly combination. U. S. Fish Commission. (C., B. & M.) 42,794.

FLY ROD.

Red cedar; duplicate joint and three tips. U. S. Fish Commission. (C., B. & M.) 42,788.

COLD BROOK HOLLOW ROD.

The "Cold Brook" hollow salmon, bass, and angling rod. Nickel-plated, with reel showing an attached line working. Patented June 22, 1875. J. L. Graves, Springfield, Mass.

The following are the advantages claimed by Mr. Graves for his new rods: "1. The line is concealed and cannot be caught in underbrush or branches. 2. The strain on the rod is equalized through the entire length. 3. There is no friction through rings or guides except on the tip. 4. The strength of the rod is greatly increased. 5. The weight of the rod is diminished. 6. The wet line is not reeled up to decay. 7. The rod goes under the brush where the big trout lie. 8. It adds greatly to the comfort and pleasure of the 'gentle art.'"

25,886.

CHUM ROD.

Two pieces; bamboo; German-silver mountings, and wound butt. U. S. Fish Commission. (C., B. & M.) 42,803.

KELLY ISLAND BLACK-BASS ROD.

Bamboo; wound butt; nickel-plated mountings. U. S. Fish Commission. (C., B. & M.) 42,799.

KELLY ISLAND BLACK-BASS ROD.

Bamboo. U. S. Fish Commission. (C., B. & M.) 42,798.

KELLY ISLAND BLACK-BASS ROD.

Bamboo. U. S. Fish Commission. (C., B. & M). 42,797.

JOINTED ROD.

Four joints, extra tips, tie guides; made of Calcutta bamboo; full mounted in brass. U. S. Fish Commission. (B. & A.). 25,513.

GENERAL FISHING-ROD.

Nine pieces; German silver mounting. U. S. Fish Commission. (B. & A.) 25,501.

TRUNK ROD.

Eight-pieces; ash and lancewood, Germansilver capped ferrules. U. S. Fish Commission. (C., B. & M.) 42,810.

TRUNK ROD.

Eight pieces; ash and lancewood, with hollow butt and German silver mountings. (U. S. Fish Commission. (C., B. & M.) 42,809.

TRUNK ROD.

Eight pieces; ash and lancewood, with hollow butt and brass mountings. U. S. Fish Commission. (C., B. & M). 42,808.

MCGUINNESS MINNOW ROD.

Three pieces; German-silver-mounted; ash and lancewood; two tips, and bamboo tip-case. U. S. Fish Commission. (C., B. & M.) 42,793.

NEWPORT BASS ROD.

Three pieces; ash and lancewood; German-silver mountings. U. S. Fish Commission. (C., B. & M.) 42,802.

GENERAL FISHING-ROD.

Six pieces; ash and lancewood; German-silver mounting. U. S. Fish Commission. (B. & A.) 25,500.

TRUNK ROD.

Seven pieces; ash and lancewood; 27½-inch pieces. U. S. Fish Commission. (C., B. & M.) 42,807.

SHORT BLACK-BASS FLY ROD.

Ash and lancewood. U. S. Fish Commission. (A. & I.) 32,244.

TROUT ROD.

Four pieces and extra tip; ash and lancewood; German-silver mounting; agate-lined tips. U. S. Fish Commission. (B. & A.) 25,506.

CALIFORNIA GENERAL ROD.

Six pieces, making three distinct styles of rods; ash and lancewood; 37½-inch joints. U. S. Fish Commission. (C., B. & M.) 42,806.

LIGHT BASS ROD.

Four pieces; extra tip; ash and lancewood; German silver mounting. U. S. Fish Commission. (B. & A.) 25,498.

BASS ROD.

Four pieces and extra tip for sea fishing; ash and lancewood; German silver mounting; jeweled tip. U. S. Fish Commission. (B. & A.) 25,497.

MOUNTAIN-TROUT ROD.

Three-pieces; German silver-mounted; ash and lancewood; weight, 8 ounces. U. S. Fish Commission. (C., B. & M.) 42,795.

TROUT FLY ROD.

Brass mounted; 6¾ ounces; extra tip and bamboo tip-case. U. S. Fish Commission. (C., B. & M.) 42,790.

FLY ROD.

Four pieces and extra tip; ash and lancewood; German silver mounting. U. S. Fish Commission. (B. & A.) 25,505.

FLY ROD.

Three pieces and extra tip; extra middle joint; bamboo tip-case; ash and lancewood; German silver mounting. U. S. Fish Commission. (B. & A.) 25,504.

FLY ROD.

German silver-mounted ash and lancewood; extra bamboo tip-case. U. S. Fish Commission. (C., B. & M.) 42,789.

TROUT FLY ROD.

Ash and lancewood. U. S. Fish Commission. (A. & I.) 39,243.

SALMON ROD.

Four pieces; ash and lancewood, with duplicate joint and three tips; bamboo tip-case. U. S. Fish Commission. (C., B. & M.) 42,784.

SALMON ROD.

Four pieces and extra tips; bamboo tip-case; ash and lancewood; German silver mounting. U. S. Fish Commission. (B. & A.) 25,507.

NEWPORT BASS ROD.

Three pieces; ash and lancewood; finest German silver mountings; duplicate joint; two tips. U. S. Fish Commission. (C., B. & M.) 42,801.

FLY ROD.

Greenheart; with split bamboo tips and bamboo tip-case. U. S. Fish Commission. (C., B. & M.) 42,787.

PIECE OF BAMBOO.

Showing splitting process in construction of rods. H. L. Leonard, Bangor, Me. 25,884.

TROUT FLY ROD.

Three pieces and extra tip; split bamboo; German silver mounting. U. S. Fish Commission. (B. & A.) 25,503.

WEAKFISH ROD.

Six-strip split bamboo; two tips. U. S. Fish Commission. (C., B. & M.) 42,804.

FOREST AND STREAM BAIT ROD.

Six-strip hexagonal split bamboo; extra tip; 9 feet long. U. S. Fish Commission. (C., B. & M.) 42,792.

BLACK BASS ROD.

Four pieces and two extra tips; split bamboo; German silver mounting. U. S. Fish Commission. (B. & A.) 25,499.

BAIT ROD.

McGinness's six-strip, hexagonal, split bamboo bait rod; extra tip; 11 feet long. U. S. Fish Commission. (C., B. & M.) 42,791.

CALIFORNIA GENERAL ROD.

Six pieces, six-strip, split bamboo, making three distinct rods. U. S. Fish Commission. (C., B. & M.) 42,805.

FLY ROD.

Three pieces and extra tip; cedar and split bamboo. U. S. Fish Commission. (B. & A.) 25,502.

LIGHT TROUT FLY ROD.

Six-strip, split bamboo. U. S. Fish Commission. (A. & I.) 39,242.

TROUT FLY ROD.

Three pieces, six-strip, hexagonal, split bamboo; weight $6\frac{3}{8}$ ounces. These two rods are protected by well seasoned pine forms, which also prevent the pieces from warping and keep them straight. U. S. Fish Commission. (C., B. & M.) 42,786.

BLACK BASS FLY ROD.

Three pieces, six-strip, hexagonal, split bamboo; weight, 10 ounces. U. S. Fish Commission. (C., B. & M.) 42,785.

GRILSE FLY ROD.

Six-strip, hexagonal, split bamboo; German silver mountings; metal reel-seat. U. S. Fish Commission (C., B. & M.). 42,783.

SALMON FLY ROD.

Six-strip, hexagonal, split bamboo; German silver mountings; metal reel-plate. "These rods are made by cementing together six triangular strips from the lower sections of the best bamboo cane." U. S. Fish Commission (C., B. & M.). 42,782.

TROLLING-POLE, HARPOON-LINE HOLDER AND CANE.

Chapman's combination. W. D. Chapman, Theresa, N. Y. 25,491.

NEWPORT STRIPED-BASS ROD.

Six-strip, hexagonal, split bamboo; ash butt; German silver mountings; agate tube top and guide; two tips. U. S. Fish Commission. (C., B. & M.) 42,800.

FISHING RODS.

Exhibited by Conroy & Bissett, of New York City:

1 Hexagonal split bamboo salmon rod, German-silver mountings, 18 feet long.

1 Hexagonal split bamboo Grilse rod, German-silver mountings, 15 feet long.

1 Hexagonal split bamboo trout and black-bass fly rod, German-silver mountings, 12 feet long.

1 Hexagonal split bamboo trout and black-bass fly rod, German-silver mountings, 11 feet long.

1 Hexagonal split bamboo Saint Lawrence rod, German-silver mountings, 10 feet long.

1 Hexagonal split bamboo McGuiness's black-bass rod, German-silver mountings, 11½ feet long.

1 Hexagonal split bamboo California general rod, making three distinct rods, German-silver mountings, 8½ to 12½ feet long.

1 Hexagonal split bamboo "Newport," or heavy bass rod, ash butt, agate tube top.

1 Hexagonal split bamboo Holberton fly rod, 2 pieces, and short ash butt. The joints of this rod are contained in the landing-net handle; the butt and folding landing-net can be carried in the angler's pocket.

1 Hexagonal split bamboo "Henshall" black-bass minnow rod, 8½ to 9 feet long.

1 Hexagonal split bamboo Southern bass or weakfish rod, 9 to 9½ feet long.

FISHING RODS.

Exhibited by William Mills & Son, of New York City, and entered for competition:

Salmon rod: Leonard's split bamboo, 16 feet, 32 ounces.
Salmon rod: Leonard's split bamboo, 15½ feet, 26 ounces.
Bass bait rod: Leonard's split bamboo, 10¾ feet, 15¾ ounces.
Bass bait rod: Leonard's split bamboo, 8¼ feet, 9¾ ounces.
Trout fly rod: Leonard's split bamboo, 11½ feet, 8¾ ounces.
Trout fly rod: Leonard's split bamboo, 10½ feet, 8½ ounces.
Catskill rod: Leonard's split bamboo, 10 feet, 4⅞ ounces.
Trunk fly rod: Leonard's split bamboo, 11 feet, 10¼ ounces.
Combination rod: Leonard's split bamboo.

FISHING RODS.

Exhibited by William Mitchell, of New York City, and entered for competition:

Salmon rods; five varieties. Trout rods; twelve varieties. Bass rods; five varieties.

"Trout fly rods:

Grade.	Length.	Weight.	Reel and line.	Leverage.
	Feet.	*Ounces.*	*Ounces.*	*Ounces.*
No. 1	12	9½	6½	30
No. 2	11½	7½	5	26
No. 3	11	6½	4¾	22
No. 4	10	4½	3½	16
No. 5	9½	4	3½	13

"Salmon rods:

Length.	Weight.	Reel and line.	Leverage.
	Ounces.	*Ounces.*	*Ounces.*
14 feet	17	19½	20
16 feet	26	22	47
16½ feet	28	22	50
17 feet	30	22	64
18 feet	35	22	74

"Split bamboo rods of the same class average from 1 to 3 ounces heavier. (See 'Henshall's Book of the Black Bass,' or 'Forest and Stream,' January 2, 1879.)

"The average leverage, holding the rods at an angle of 30° from the horizontal, is fairly two-thirds of the foregoing. Rod No. 1 is a standard black-bass rod. Upon a No. 2 was caught and killed, without gaff or net, a salmon which weighed 33 pounds. No. 3 is the 'standard' trout rod at present in this part of the country. A 'standard' rod of 1843, made for Daniel Webster (sent in for repair), has also been tested: Length, 12 feet; weight, 17½ ounces; weight of reel and line, 7 ounces; leverage, 5 pounds. As the reel is above the hand, this rod of 1843 is not so strong, nor will it stand work, nor can it cast as far as the 11-feet standard of to-day. A 10-ounce rod is now almost as obsolete as that one of 1843.

"A fly rod of 11 feet in length, weighing 6½ ounces, having on it a No. 4 reel and line weighing 4¾ ounces (grip above reel, of course), the leverage is 22 ounces, that is, if the rod be held level; upright, of course, there is no leverage; if the rod were held most of the time at an angle of 45°, the average power exerted would be 11 ounces; but the rod is held lower, nearer 30°, and it is safe to say that, on such a light rod, a power of over more than one pound and a half is constantly straining on the muscles."

HEXAGONAL SPLIT-BAMBOO FISHING-RODS.

Exhibited by B. A. Nichols, of Boston, Mass.:

Fly rods.

No. 1. 10 feet long; three pieces; weight, 7 ounces; two tips; bamboo tip-case; sack and wood shipping case.

No. 2. 11 feet long; three pieces; weight, 8 ounces; two tips; bamboo tip-case; sack and wood shipping case.

No. 3. 11½ feet long; three pieces; weight, 9 ounces; two tips; bamboo tip-case; sack and wood shipping case.

No. 4. 11½ feet long; three pieces; weight, 10 ounces; two tips; bamboo tip-case; sack and wood shipping case.

No. 5. 12 feet long; three pieces; weight, 10½ ounces; two tips; bamboo tip-case; sack and wood shipping case.

No. 6. 12 feet long; three pieces; weight, 12½ ounces; two tips; bamboo tip-case; sack and wood shipping case.

No. 7. General rod: 11½ feet long, with fly tip; weight, 10½ ounces. And 9½ feet long: weight, 9½ ounces, with short tip (2 feet long), for bait fishing or trolling. This is a very handy rod, is suitable for bass or trout, with the fly tips (of which there are two), and bait fishing or trolling, with the short tip; making the rod in three pieces; bamboo tip-case; sack and wood shipping case.

Black-bass rods.

No. 8. 10 feet long; three pieces; weight, 9½ ounces; ring guides; reel-seat below grasp; two tips; bamboo tip-case; sack and wood shipping case.

No. 9. 10 feet long; three pieces; weight, 10 ounces; standing guides; reel-seat above grasp; two tips; bamboo tip-case; sack and wood shipping case.

No. 10. 8½ feet long; two pieces; weight, 9½ ounces; standing guides; reel-seat above grasp; two tips; grooved wood case; sack and wood shipping case.

Striped-bass rods.

One rod; 8 feet long; two pieces; weight, 19 ounces.
One rod; 8½ feet long; two pieces; weight, 20 ounces.
One rod; 9 feet long; two pieces; weight, 25 ounces.
One rod; 8 feet long; three pieces; weight, 20 ounces.
One rod; 8½ feet long; three pieces; weight, 22 ounces.
One rod; 9 feet long; three pieces; weight, 25 ounces.

Salmon rods.

One rod; 16 feet long; three pieces; weight, 26 ounces.
One rod; 16½ feet long; three pieces; weight, 27 ounces

Salmon rods—Continued.

One rod; 17 feet long; three pieces; weight, 28 ounces.
One rod; 17½ feet long; three pieces; weight, 30 ounces.
One rod; 18 feet long; three pieces; weight, 32 ounces.

Grilse rods.

One rod; 14 feet long; weight, 22 ounces.
One rod; 14½ feet long; weight, 23 ounces.
One rod; 15 feet long; weight, 24 ounces.
All rods have full German-silver reel-plate and mountings, and grooved cases covered with cloth and cloth sacks. All above rods have two duplicate tips.

Caledonia fly rods.

No. 1. 9 feet 4 inches long; weight, 5¼ ounces; 3 pieces; 2 tips.
No. 2. 9 feet 8 inches long; weight, 6 ounces; 3 pieces; 2 tips.
Full German-silver mounting, grooved cases, &c.

The tourist combination rod.

Twelve feet long; in 4 pieces; weight 13 ounces; with extra butt-joint, and extra reversible grasp and reel-seat (to be used with reel above or below the hand), and extra short tip for trolling or bait fishing, and extra long butt-joint to be used instead of first and second joints, making a 9-foot 7-ounce fly rod, making in all 8 pieces, and four regular and perfect rods, all in a cloth-covered grooved case 3 feet 3 inches long, all weighing about 4 pounds when packed. It has full German-silver mountings.

FISHING RODS.

Exhibited by A. B. Shipley & Sons, of Philadelphia, Pa., and entered for competition:

Six-strip split-bamboo rod, $20.
Six-strip split-bamboo rod, $30.
Split-bamboo rod and reel in case.
Bethabara wood, 10-foot pole, $16.50.
Bethabara wood, pole 5½ ounces, $10.50.
Bethabara wood, 12-foot pole, $16.50.

DISGORGERS AND CLEARING-RINGS.

GULLETER.

Made of brass, for end of Lothrop's improved gob-stick. Gloucester, Mass., 1883. 57,049. U. S. Fish Commission.

FISH-HOOK EXTRACTOR (J. W. Foard's patent).

"Using the end of the instrument corresponding to the size of your hook, run it down the line into the bend of the hook; then draw

FISH-HOOK EXTRACTOR—Continued.

the line moderately taut and clamp it against the side of the shaft, and push the whole down till the barb of the hook is disengaged, and the hook will come out with the instrument." U. S. Fish Commission. 57,682.

DISGORGER.

For taking hook from mouth or stomach of fish. Philadelphia, Pa. Exhibit of A. B. Shipley & Sons.

HOOK-CLEARER.

Piece of lead pipe used for releasing the hook when caught in a log or other obstruction. Skaneateles, N. Y., 1883. 57,042. Collected by Reuben Wood.

BRASS CLEARING-RING.

For releasing the line when caught at bottom of river. Exhibit of A. B. Shipley & Sons, Philadelphia, Pa.

FISH-BASKETS.

WILLOW CREEL.

With leather and web strap. U. S. Fish Commission (C., B. & M.). 42,855.

WILLOW CREEL.

Showing new style of left shoulder-strap. U. S. Commission (C., B. & M.). 42,856.

HOME-MADE CREEL.

Made in the woods by Joseph Willets, esq., of strips of wood. Oval shape; 10½ inches deep; 1 foot wide. Skaneateles, N. Y. Joseph Willets. 57,670. Used for holding fish.

FISH-BASKET.

Large pouch-like basket, made of bark of arbor-vitæ, used as a receptacle for dried fish. Makah Indians, Neah Bay, Washington Territory. 72,682. James G. Swan.

LIVE BOXES.

MINNOW AND FISH CRATE. (Osgood's patent.)

Made of wood and cotton cloth, folding. Extended ready for use it measures 24 inches long, 8 inches wide, 8 inches deep. Its weight is 1½ pounds. U. S. Fish Commission (C., B. & M.). 42,828. "The crate extended ready for use measures 24 inches long, 8 inches wide, 8 inches deep. The crate when folded is 12 inches long, 8 inches wide, 2 inches deep. Its weight is 1½

MINNOW AND FISH CRATE—Continued.

pounds. Every angler knows the difficulty of keeping minnows alive and the frequent failure of all ordinary means for preserving them. It is claimed that the crate meets this want. Floating beside or behind a boat its drag is scarcely perceptible. It occupies so little depth that danger from fastening on logs, &c., is almost entirely obviated. When folded, it occupies so little space that one could easily carry it under his buttoned coat during a walking excursion. Another feature that highly recommends this crate is the ease with which the bait is secured when a fresh minnow is required. No lifting is necessary. By simply tipping up the bow, the lower half or stern is submerged, leaving the door clear above the water and convenient to the hand."

MINNOW-CRATE.

A small collapsible crate made of wood and canvas. Used by anglers to keep small fish alive which are to be used as live bait. Exhibited by N. A. Osgood, Battle Creek, Mich.

MINNOW-PAIL.

Tin; tubular; flat bottom and top; painted green, with lettering "The gem fish-bait pail." Air-holes in top; movable tray inside. Height, 14 inches; diameter, 1 foot; capacity, 16 quarts. U. S. Fish Commission. 57,674. Used to carry live minnows for bait.

LIVE CARS FOR FISH AND LOBSTERS. (For description see Sec. K.).

MACKEREL POCKET.

A small model of a mackerel pocket, made of cotton netting. Used by the mackerel fishermen in connection with the purse-seine fishery. When more mackerel are taken than can be dressed at once the surplus is turned into the mackerel pocket, which is suspended from out-riggers fastened to the vessel's deck, the bottom extending 6 to 10 feet below the surface of the water. The mackerel are thus kept alive until such time as they can be cared for. Exhibited by George Merchant, jr., Gloucester, Mass.

FISH INCLOSURE (photograph).

A large inclosure on Detroit River, made by staking off a portion of the shoal water along the bank, and used for keeping fish alive until such time as there is a demand for them in the market. The seine is frequently drawn to the mouth of the inclosure and the fish allowed to enter without being handled. Detroit, Mich., 1882. (751) 2,212. U. S. Fish Commission.

BROOMS.

HALIBUT SCRUB-BROOM.

A rough broom, made from the butt of a white-oak sapling, the end of which is split into fibers which are tightly tied with marline, after which the end of the broom is rounded. Gloucester, Mass., 1883. 57,812. U. S. Fish Commission. Used for cleaning halibut after they have been eviscerated and preparatory to being packed in ice.

HALIBUT SCRUB-BROOM.

Made of oak sapling, the butt end being stripped into fibers to form the broom; these are firmly bound together and their ends trimmed off. Gloucester, Mass., 1878. 32,718. Capt. J. W. Collins. Used for cleaning blood, &c., from the backbone of halibut before they are iced.

LAMPS AND LANTERNS.

(For descriptions see Sec. I.)

SEALER'S ACCESSORIES.

ESKIMO ICE-BRUSH.

Handle, wood; flaring bone butt-piece inserted in recessed handle and wrapped with strips of seal-skin. Brush consists of a narrow strip of baleen, horn-colored, with fringe attached, and seized to the handle with seal-skin thongs. Length, 30 inches. King's Island, Alaska. 63,606. Collected by E. W. Nelson. Used by natives for brushing away snow when seal-hunting, and also for brushing snow and ice from their garments.

SEAL-HUNTER'S STOOL.

Wood, heart-shaped; triangular hole cut near the center with chamfered edge on lower sides; three small wooden pegs inserted as legs. Size, $12\frac{3}{4}$ by 8 inches; height, $5\frac{3}{8}$ inches. Anderson River, Arctic coast. 3,978. Collected by Robert Macfarlane. A roughly constructed but durable utensil. Used by Eskimo to stand upon while watching for seals in winter

ANGLER'S CAMPING OUTFIT.

(For a more detailed list of angler's camping outfit see Sec. I.)

PACK-RACK.

An old-fashioned angler's pack-rack, which can be strapped to the back and loaded with blankets and other outfit in reaching camping-grounds which are inaccessible to wagons. Exhibited by Joseph C. Willetts, Skaneateles, N. Y.

FISHING-BAG.

Made of water-proof canvas, bound with leather; leather shoulder-strap. U. S. Fish Commission. (C., B. & M.). 42,850.

HEAD-NET.

Folding mosquito and black fly-net. U. S. Fish Commission. 42,851.

PARKER POCKET-SCALE.

U. S. Fish Commission. 57,680. Used for weighing fish, &c.

ANGLER'S POCKET-SCALE. (Parker's patent.)

Folding handle. U. S. Fish Commission. 57,680 (a).

NOVELTY-POCKET SCALE.

Patented February 26, 1878. Place the pail or basket on the hook, bring the sliding shell down to O, then weigh the matter, and you get its exact weight without subtracting the weight of the receptacle. Weighs up to 15 pounds. U. S. Fish Commission. 57,681.

RANGELEY TROUT.

Pencil sketch on birch-bark. Trout weighed 9½ pounds. Caught October 10, 1877, by Henry O. Stanley. Dixfield, Me., 1877. 56,943. Gift of Henry O. Stanley.

A CAN OF BONELESS HAM.

Seven and one-half pounds. U. S. Fish Commission. 56,848.

A PACKAGE OF HECKER'S SELF-RAISING GRIDDLE-CAKE FLOUR.

Six pounds. U. S. Fish Commission. 57,622.

C.—APPARATUS TO A GREATER OR LESS EXTENT AUTOMATIC.

V.—NETS.

17. Entangling nets.

MESHING-NETS (ENTANGLING IN MESHES).

FIXED NETS (NETS HELD IN POSITION BY MEANS OF STAKES OR ANCHORS).

WHITEFISH GILL-NET.

Model, scale 1 inch to foot. Strung between driven stakes and hung to wooden floats that keep the net from sagging. Waukegan, Ill., 1876. 25,751. Gift of J. W. Milner. These nets are used in Lake Michigan for the capture of whitefish.

SHAD GILL-NET.

Model. American Net and Twine Company, Boston and New York. 26,126. Used in rivers of the Atlantic coast.

"These nets are knit of linen thread (22–50, 3-cord, and 20–60, 2-cord). They range in length from 50 to 200 fathoms, and in depth from 25 to 90 meshes, $4\frac{3}{4}$ to 5 inch mesh. They are used exclusively as drift-nets. On the Connecticut River about 4,000 pounds of this netting are used annually. The average weight of a net is 30 to 40 pounds, its depth 45 to 50 meshes, $5\frac{1}{4}$ to $5\frac{1}{2}$ inches. On the Hudson River about 7,500 pounds are annually used, fine-threads 50–75, 2-cord), 100 to 200 fathoms in length, and from 50 to 90 meshes in depth, $4\frac{3}{4}$ to 5 inch, weight from 15 to 30 pounds to the net. In the Delaware, Potomac, and Chesapeake 20,000 pounds are used, from 30 to 60 meshes in depth, and $5\frac{1}{8}$ (30 to 40, 2-cord) length, 75 to 100 fathoms. In the rivers of North Carolina nets are made from coarse twine (22–35, 3-cord, and 20–35, 2-cord) 25 to 40 meshes in depth, 5–$5\frac{1}{2}$ gauge; their length is about 100 yards. About 25,000 pounds are used annually. In the rivers of South Carolina the twine is slightly finer than in North Carolina (25–35, 3-cord), 25 to 60 meshes deep, the size otherwise about the same; 1,500 pounds are used annually. In Georgia and Florida about 6,000 pounds are used. This netting is knit from linen thread (30–40, 3-cord, and 25–35, 2-cord) 40 to 60 meshes in depth; $4\frac{3}{4}$ to $5\frac{1}{4}$ mesh. About 18 to 24 pounds are used in a net; its length, 100 yards."—(*A. A. French.*)

HERRING GILL-NET.

Rigged for use; 2¼-inch mesh; inner and outer buoys; middle or watch buoy; stone killicks and warps. Length of net 20 fathoms, 150 meshes deep. Rockport, Mass., 1882. 54,542 to 54,548. U. S. Fish Commission. Common style of herring gill-net used at Cape Ann and other parts of New England.

HERRING-NET.

Tanned cotton, 2½-inch mesh, 14–6 twine, fully mounted. Exhibited by the American Net and Twine Company, Boston, Mass.

HERRING-NET.

Tanned cotton, 2½-inch mesh, 10–4 twine, fully mounted. Exhibited by the American Net and Twine Company, Boston, Mass.

COD GILL-NET.

Hung complete, with glass floats; tanned linen twine No. 40; mesh, 9 inches. Length, 150 yards straight, 113 yards hung; depth, 18 meshes. U. S. Fish Commission. Gill-nets for the capture of cod have been used in the vicinity of Cape Ann since the winter of 1878–'79. During the winter of 1882–'83 they were used to much advantage, because of a scarcity of bait.

MINNOW-NET.

Pyramid Lake, Nevada. S. Powers. 19,048.

GILL-NET.

Anderson River Eskimo. Anderson River, Hudson Bay Territory. R. Macfarlane. 1,667.

GILL-NET MADE OF ANIMAL FIBER.

Kawquettle Indians. Vancouver's Island, British Columbia. Dr. T. T. Minor. 7,962.

GILL-NET.

Cooyuwee Pai Ute Indians. Pyramid Lake, Nevada. Stephen Powers. 19,043.

GILL-NET MADE OF "BABICHE."

Anderson River Indians. Mackenzie's River district, Hudson Bay Territory. R. Macfarlane. 4,765.

GILL-NET OF "BABICHE."

Fort Anderson, Mackenzie's River. R. Macfarlane. 4,793.

DRIFT-NETS (NETS DRIFTING ACROSS THE TIDE).

SALMON-NET.

Made of the fiber of the common stinging nettle, (*Urtica dioica*, L.). Stretched on light square frame at the end of a long pole. To the point of the net is fastened a bunch of thin narrow strips of white wood, which apparently acts as a lure. Made by the Quilleute Indians, about 30 miles south of Cape Flattery. Pole, 13 feet long. Net, 5 feet square, 40 inches deep, mesh 5 inches. Washington Territory, 1883. 72,835. James G. Swan, Port Townsend, Wash. Used by one canoe drifting down the river at night.

SALMON-NET FOR DRIFTING.

Made of the fiber of the common stinging nettle (*Urtica dioica*, L.). Stretched between the ends of two long poles. To the point of the net is fastened a bunch of thin narrow strips of white wood, which apparently acts as a lure. Made by the Quilleute Indians, about 30 miles south of Cape Flattery. Pole, 14½ feet long. Net, 8 feet 6 inches spread, 33 inches wide, 5 feet deep, mesh 5 inches. Washington Territory, 1883. 72,834. James G. Swan, Port Townsend, Wash. Used by two canoes drifting down the river at night.

PHOTOGRAPHS, DRAWINGS, AND PAINTINGS, ILLUSTRATIVE OF THE GILL-NET FISHERY.

WHITEFISH GILL-NETS.

Photographic view of dock and shore-buildings belonging to fishermen engaged in the fisheries of the Great Lakes, showing whitefish and herring gill-nets wound upon reels to dry. Size, 8 by 10 inches. Alpena, Mich., 1882. (779) 2,235. U. S. Fish Commission.

NET-REELS.

Photograph showing reels used for holding stake gill-nets when not in use. The reels are made of open work, and the nets, as soon as they are landed, are wound upon them, where they dry very quickly. Size, 8 by 10 inches. Alpena, Mich., 1882. (782) 2,237. U. S. Fish Commission.

WHITEFISH GILL-NETS.

Photograph showing dock and shore-buildings belonging to fishermen engaged in the fisheries of the Great Lakes, with whitefish and herring gill-nets wound upon reels to dry. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Alpena, Mich., 1882. (779) 2,235. U. S. Fish Commission.

NET-REELS.

Photograph showing reels used for holding gill-nets when not in use. The reels are made of open work, and the nets, as soon

NET-REELS—Continued.

as they are landed, are wound upon them, where they dry very quickly. Size, 30 by 40 inches. Enlarged by an electric light from an 8 by 10 negative. Alpena, Mich., 1882. (782) 2,237. U. S. Fish Commission.

NORTH CAROLINA STURGEON CAMP.

A crayon sketch showing a barge with small shanties at either end, and a crew of sturgeon fishermen engaged in killing sturgeon to be iced for shipment to New York. The sturgeon are usually caught in gill-nets and brought to the camp, where they are tied by the tail to stakes driven in the mud along the river bank and kept until butchering day arrives. They are then killed, the tails being first chopped off, after which the heads, viscera, and skins are removed, and the fish packed in ice to cool. The following morning they are repacked in boxes, loaded on a small vessel, and carried to the steamboat-wharf for shipment. Size 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

GILL-NET FISHING.

Photograph of John Connelly hauling herring-nets into a dory. Size, 8 by 10 inches. Taken at Rockport, Mass., September, 1882. (57) 1,829. U. S. Fish Commission.

OVERHAULING HERRING-NETS.

Photograph of Frank Marble and John Hodgdon, just returned from herring-fishing, overhauling their nets in the dory, which is stranded on Niles's Beach. Size, 8 by 10 inches. Gloucester, Mass., 1882. (475) 2,034. U. S. Fish Commission.

HERRING NET-FISHING.

Photographic view of fishermen engaged in fishing with herring gill-nets from Irish boat; showing the method of hauling and picking. Size, 8 by 10 inches. Gloucester, Mass., 1882. (437) 2,006. U. S. Fish Commission.

HERRING NET-FISHING.

Photograph of schooner Valiant, of Friendship, Me., sailing out of Portland Harbor, with all of her apparatus and outfit, for engaging in the herring fishery with gill-nets, at Wood Island, Me. Many of the small vessels along the coast of Maine go to Portland to fit out for this fishery. Size, 8 by 10 inches. Taken at the mouth of Portland Harbor, 1882. (129) 1,866. U. S. Fish Commission.

MENDING HERRING-NETS.

Photograph showing crew of schooner Aroline, of Bremen, Me., detained in Portland Harbor by storm while on her way to the herring fishing-grounds off Wood Island, Me. The crew are employing their time in overhauling and mending their nets, which have been spread out on the ground for that purpose. It is a common practice among fishermen to mend their nets while detained in harbor by bad weather on their way to the fishing-grounds. Size, 8 by 10 inches. Taken at House Island, near Portland, Me., 1882. (115) 1,860. U. S. Fish Commission.

HERRING NET-FISHING.

Photograph showing schooner Valiant of Friendship, Me., sailing out of Portland Harbor, with all of her apparatus and outfit for engaging in the herring fishery with gill-nets, at Wood Island, Me. Many of the small vessels along the coast of Maine go to Portland to fit out for this fishery. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Taken at the mouth of Portland Harbor, 1882. (129) 1,866. U. S. Fish Commission.

HERRING NET-FISHING.

Photograph of fishermen engaged in fishing herring gill-nets from Irish boat, showing the method of hauling and picking. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Gloucester, Mass., 1882. (437) 2,006. U. S. Fish Commission.

MENDING HERRING-NETS.

Photograph of crew of schooner Aroline, of Bremen, Me., detained in Portland Harbor by storm while on her way to the herring fishing-grounds off Wood Island, Me. The crew are employing their time in overhauling and mending their nets, which have been spread out on the ground for that purpose. It is a common practice among fisherman to mend their nets while detained in harbor by bad weather on their way to the fishing-grounds. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Taken at House Island, near Portland, Me., 1882. (115) 1,860. U. S. Fish Commission.

OVERHAULING HERRING-NETS.

Photograph showing Frank Marble and John Hodgdon, just returning from herring fishing, overhauling their nets in the dory, which is stranded on Niles's beach. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Gloucester, Mass., 1882. (475) 2,034. U. S. Fish Commission.

FISHING HERRING-NETS.

A crayon sketch showing two fishermen engaged in hauling their nets into a common net-boat, removing the fish as the nets are hauled in. The view shows the common method of setting and hauling nets on the coast of Maine. They are usually set at night and allowed to remain until daybreak the following morning, when they are hauled, the fish removed, and the nets mended and spread out on the shore to dry. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott and J. W. Collins.

GILL-NET FISHING.

Photograph of men employed in setting gill-nets for night-fishing, at the mouth of the Susquehanna River; showing a portion of the net in the water and a lantern at the end, which enables the fishermen to find the net in the darkness. Size, 8 by 10 inches. Havre de Grace, Md., 1877. 2,250. U. S. Fish Commission.

DRIFTING FOR MACKEREL.

A night scene (painted in oil) showing the crew of a Maine mackerel schooner engaged in fishing for mackerel with gill-nets. The view shows the vessel "swinging to the nets," with a light in the rigging and mainsail set, while one of the crew is out in a dory with a flash-light signaling a passing vessel away from the nets, which would be seriously injured by her running over them. Size, 30 by 40 inches.

POCKET NETS (ENTANGLING IN POCKETS).

TRAMMEL-NET.

Model of trammel-net, 10 feet long, 2 feet wide, 2 and 5 inch mesh. William E. Hooper & Sons, Baltimore, Md. 25,270.

TRAMMEL-NET.

American Net and Twine Company. 26,118, 26,129. "Used for general fishing in rivers and ponds of Northern Mississippi Valley. These nets range from 20 to 75 yards in length, 4 to $6\frac{1}{2}$ feet in depth; the inside netting of finer linen thread (20–25, 3-cord), mesh 2–$2\frac{1}{4}$, $\frac{1}{3}$ deeper than the outside. The outside netting-wall from cotton (15–21 thread), mesh 8 to 10 inches."—(*A. A. French.*)

18. ENCIRCLING NETS.

HAUL-SEINES.

HERRING-SEINES.

Models of herring-seines. Used on coasts of New England and the Provinces in capture of herring (*Clupea harengus*), and in the Hudson, Potomac, Delaware, and Chesapeake, and in North

HERRING-SEINES—Continued.

Carolina. American Net and Twine Company, Boston, Mass. 26,119, 26,127.

COD-SEINE.

Model of cod-seine. Used in British Provinces in capture of cod (*Gadus morrhua*). American Net and Twine Company, Boston and New York. 30 to 40 feet deep. Mesh 5 inches, 18 to 21 thread, cotton. 26,137.

RIVER-SEINE.

One river-seine, 100 feet long, 8 to 10 feet deep, $2\frac{1}{2}$-inch mesh, $12\frac{1}{2}$ patent twine, tanned and fitted complete. Exhibited by the American Net and Twine Company, Boston, Mass.

BAIRD COLLECTING-SEINE.

Baird net. Designed by Prof. S. F. Baird. Used by naturalists in collecting small fishes in brooks and ponds, and in following behind large seines to secure the small species which escape through the meshes, 6-thread coarse cotton. American Net and Twine Company, Boston, Mass. 26,136.

BAIRD NET.

Model of Baird net. American Net and Twine Company, Boston, Mass. 26,126.

BAIT-SEINE.

Model of minnow-seine. Used by amateurs in capture of minnow bait; $\frac{1}{2}$ to $\frac{5}{8}$ inch mesh, 6-thread cotton twine. American Net and Twine Company, Boston, Mass. 26,123, 26,130.

BAIT-SEINE.

Model of minnow-seine, with bag. Used by fishermen to secure bait for eel-pots. American Net and Twine Company, Boston, Mass. 26,121.

SEINES USED BY INDIANS AND ESKIMO.

Seine. Anderson River Eskimo. Mackenzie's River district. Robert Macfarlane. 2,232.

Seine made of "babiche." Tschuktchi tribe. Capt. John Rodgers, U. S. N., North Pacific Exploring Expedition. 2,444.

Seine made of "babiche." Tschuktchi tribe. Capt. John Rodgers, U. S. N., North Pacific Exploring Expedition. 2,445.

Hand-seine, made of grass. Tschuktchi tribe. Capt. John Rodgers, U. S. N., North Pacific Exploring Expedition. 2,446.

Hand-seine, made of grass. Tschuktchi tribe. Capt. John Rodgers, U. S. N., North Pacific Exploring Expedition. 2,447.

SEINES USED BY INDIANS AND ESKIMO—Continued.

Salmon-net. McCloud River Indians. Shasta County, California. Livingston Stone. 19,234.

Salmon-net, with wooden floats and stone sinkers. Indians of Northwest coast. Fort Simpson, B. C. J. G. Swan. 20,648.

Hand-seine. Anderson River Eskimo. Mackenzie's River district, H. B. T. R. Kennicott. 2,231.

Fishing-net. Made from fibers of pineapple (*Tillandsia* sp.). Mirador, Mex. Dr. Sartorius. 7,929.

Fishing-net made of willow bark. Kootchin Indians. Mackenzie's River district. R. Kennicott. 897.

Net made of "silkweed." Fort Crook Indians. Fort Crook, Cal. Capt. J. W. T. Gardiner. 4,883.

PHOTOGRAPHS, DRAWINGS, AND PAINTINGS ILLUSTRATIVE OF THE HAUL-SEINE FISHERY.

HAULING SHAD-SEINE.

Photograph similar to 2,146 (660), from a nearer point, and after the seine is nearer the beach. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (663) 2,148. U. S. Fish Commission.

WHITE-FISH SEINE AND REEL.

Photograph of a seine used on the Great Lakes in catching lake herring and whitefish, wound on a reel to dry. This is the common method of drying seines used in the fisheries of the Great Lakes. Size, 8 by 10 inches. Detroit, Mich., 1882. (749) 2,210. U. S. Fish Commission.

SEINING WHITEFISH.

Photograph showing fishermen in the act of turning their catch from the seine into the inclosure where the fish are to be kept until the price advances sufficiently to warrant their shipment to market. Size, 8 by 10 inches. Detroit, Mich., 1882. (753) 2,213. U. S. Fish Commission.

WHITEFISH SEINING.

Photograph of Detroit fishermen engaged in hauling seine for whitefish; showing the methods usually employed in seine-fishing on the Great Lakes. Size, 8 by 10 inches. Belle Isle, Detroit River, Mich. (732) 2,196. U. S. Fish Commission.

SEINING SHAD AND ALEWIVES.

Photograph showing the landing of a seine, with an enormous draught of shad and alewives, at the Sutton Beach fishery, Albemarle Sound. The catch is so large that men are obliged to wade in the water behind the seine to assist in getting it ashore without breaking it. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,253. U. S. Fish Commission.

LOADING SHAD-SEINE.

Photograph showing men engaged in loading a large shad-seine on a boat at the Capehart fishery, in Albemarle Sound, preparatory to shooting it. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,251. U. S. Fish Commission.

HAULING SHAD-SEINE.

Photograph showing fishermen in the act of landing a seine fished for shad and herring in the Susquehanna River. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (662) 2,147. U. S. Fish Commission.

DRESSING ALEWIVES.

Photograph of a gang of negroes cutting and washing alewives that have been caught in a seine at the Capehart fishery on Albemarle Sound. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,252. U. S. Fish Commission.

LOADING SHAD-SEINE.

Photograph showing men engaged in loading a large shad-seine on a boat at the Capehart fishery in Albemarle Sound, preparatory to shooting it. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Avoca, N. C., 1877. 2,251. U. S. Fish Commission.

SEINING SHAD AND ALEWIVES.

Photograph showing a seine with an enormous catch of shad and alewives, being landed at the Sutton Beach fishery, Albemarle Sound. The catch is so large that men are obliged to wade in the water behind the seine to assist in getting it ashore without breaking it. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Avoca, N. C., 1877. 2,253. U. S. Fish Commission.

DRESSING ALEWIVES.

Photograph showing a gang of negroes cutting and washing alewives at the Capehart fishery on Albemarle Sound. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Avoca, N. C., 1877. 2,252. U. S. Fish Commission.

HAULING SHAD-SEINE.

Photograph showing fishermen in the act of landing a seine fished for shad and herring in the Susquehanna River. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Harve de Grace, Md., 1882. (662) 2,147. U. S. Fish Commission.

LAYING OUT SHAD-SEINE.

An India-ink sketch, showing a fishing crew engaged in shooting a shad seine in North Carolina waters. The seine is upwards of a mile in length, one-half of it being loaded on a small paddle-wheeled steamer, while the other half is loaded on a twenty-four oared seine-boat. The two boats proceed to the stake which marks the center of the fishing-ground, a mile or more from the shore; when they proceed in opposite directions, paying out the seine as they go, and carrying the line to the beach, where it is attached to drums worked by steam-engines which are employed in hauling the seine. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

TRAILING NETS.

BEAM TRAWL.

For dragging along the bottom at a distance from the shore. 32,720. Made by J. G. Adam. U. S. Fish Commission.

PURSING NETS.

PURSE-SEINE.

One hundred and sixty-five fathoms long, 10 fathoms or 500 meshes deep, $2\frac{1}{8}$-inch mesh; made of No. 10 twine. American Net and Twine Company, Boston, Mass. These purse-seines range in length from 120 to 220 fathoms, and from 500 to 1,000 meshes in depth, reaching the depth of 20 to 30 fathoms of water. The average mesh is $2\frac{1}{8}$ inches. They are made of fine Sea Island cotton twine, and cost from $750 to $1,500 complete. About 300 are now in use on the coast of North America. The pursing weight varies from 100 to 150 pounds.

HERRING PURSE-SEINE.

American Net and Twine Company, Boston, Mass. 32,781.

MACKEREL PURSE-SEINE.

Model of purse-seine. George Merchant, Gloucester, Mass.

PHOTOGRAPHS, DRAWINGS, AND PAINTINGS, ILLUSTRATIVE OF THE PURSE-NET FISHERY.

PURSE-SEINE ON SEINE-BOAT.

Photograph of the seine-boat belonging to schooner E. W. Merchant, of Gloucester, Mass; fully manned; showing the seine properly stowed in the boat, ready to be "shot." Size, 8 by 10 inches. Taken at Rockport, Mass., 1882. (62) 1,831. U. S. Fish Commission.

MACKEREL CRUISING.

Photographic view of a fleet of thirty or forty schooners, engaged in the mackerel purse seine fishery, cruising about on the fish-

MACKEREL CRUISING—Continued.

ing-grounds in search of mackerel. The picture shows the number of vessels that frequently cruise in a small area. Size, 8 by 10 inches. Massachusetts Bay, 1882. (277) 1,940. U. S. Fish Commission.

OVERHAULING PURSE-SEINE.

Photograph of schooner James Bliss, of Gloucester, engaged in the purse-seine mackerel fishery, showing men on deck overhauling the seine preparatory to loading it on the seine-boat. Size, 8 by 10 inches. Massachusetts Bay, 1882. (288) 1,946 *a*. U. S. Fish Commission.

LOADING PURSE-SEINE ON SEINE-BOAT.

Photograph of schooner James Bliss, engaged in the mackerel purse-seine fishery, with men transferring seine from the vessel's deck to a seine-boat, which is being towed alongside, preparatory to setting it. Size, 8 by 10 inches. Massachusetts Bay, 1882. (287) 1,947. U. S. Fish Commission.

DRESSING MACKEREL.

Photograph of schooner Laura Nelson, Gloucester, Mass., showing the crew engaged in dressing mackerel on deck, the vessel being under sail at the time. Size, 8 by 10 inches. Massachusetts Bay, 1882. (265) 1,935. U. S. Fish Commission.

DRESSING MACKEREL.

Photograph of schooner Frank Foster, of Gloucester, Mass., with 200 barrels of mackerel on deck, and crew actively engaged in splitting and gibbing them. Size, 8 by 10 inches. Taken at Gloucester, Mass., 1882. (321) 1,968. U. S. Fish Commission.

DRESSING MACKEREL.

A photograph similar to (321) 1,968, showing starboard side of the same vessel, with a portion of the crew at work. Size, 8 by 10 inches. Gloucester, Mass., 1882. (316) 1,966. U. S. Fish Commission.

DRESSING MACKEREL.

A photographic view similar to (321) 1,968, showing the port side of same vessel, with portion of the crew at work. Size, 8 by 10 inches. Gloucester, Mass., 1882. (318) 1,967. U. S. Fish Commission.

MACKEREL LOOKOUT.

Photograph of schooner Mabel Dilloway, of Gloucester, Mass., cruising on the mackerel fishing grounds; showing man aloft looking for a school of fish. Size, 8 by 10 inches. Massachusetts Bay, 1882. (268) 1,936. U. S. Fish Commission.

MENHADEN FISHING.

Photograph of deck of menhaden steamer, showing the method of carrying the fish in the holds. Size, 8 by 10 inches. Tiverton, R. I., 1882. (409) 1,990. U. S. Fish Commission.

SALTING SEINE.

Photograph of menhaden steamer, showing men engaged in overhauling and salting the purse-seine to prevent it from heating and rotting when left in a pile; also, a gang of shoresmen engaged in unloading steamer. Size, 8 by 10 inches. Tiverton, R. I., 1882. (411) 1,991. U. S. Fish Commission.

MACKEREL LOOKOUT.

Photograph of schooner Mabel Dilloway, of Gloucester, Mass., cruising on the mackerel fishing-ground; showing man aloft looking for a school of fish. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Massachusetts Bay, 1882. (268) 1,936. U. S. Fish Commission.

DRESSING MACKEREL.

Photograph of schooner Frank Foster, of Gloucester, Mass., with 200 barrels of mackerel on deck, and crew actively engaged in splitting and gibbing them. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Taken at Gloucester, Mass., 1882. (321) 1,968. U. S. Fish Commission.

DRESSING MACKEREL.

Photographic view similar to (321) 1,968, showing the port side of same vessel with portion of the crew at work. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Gloucester, Mass. (318) 1,967. U. S. Fish Commission.

DRESSING MACKEREL.

Photograph of schooner Laura Nelson, of Gloucester, Mass., showing the crew engaged in dressing mackerel on deck, the vessel being under sail at the time. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Massachusetts Bay, 1882. (265) 1,935. U. S. Fish Commission.

MACKEREL POCKET OR SPILLER.

India-ink sketch of a New England fishing vessel, provided with a mackerel pocket, which hangs suspended from the side of the vessel reaching to the depth of 7 or 8 feet below the surface, the upper part of the netting ascending 2 or 3 feet above. The pocket was introduced into the mackerel-seine fishery in 1878 for holding the surplus catch which would otherwise spoil before being cleaned and salted. Prior to the introduction of

MACKEREL POCKET OF SPILLER—Continued.

the pocket a large part of the catch was often thrown away; but now the surplus mackerel are emptied into the pocket where they remain alive and in good condition until the fishermen can care for them. Size, 30 by 40 inches. Washington, D. C., 1882. H. W. Elliott & J. W. Collins.

BAILING-IN MACKEREL.

An oil-painting of a Gloucester mackerel schooner, showing the crew engaged in bailing the mackerel on deck after they have been caught in a purse-seine. The cork-lines on one side of the seine are thrown over the vessel's rail, and members of the crew are engaged in hoisting in the fish by means of long-handled dip-nets which are worked by pulleys fastened in the rigging. The remainder of the crew are in the seine-boat "drying up" the net and gradually bringing the fish into a more compact mass near the vessel. Size, 26 by 40 inches.

DRYING-UP MENHADEN-SEINE.

An oil-painting showing the crew of a menhaden steamer engaged in pursing-up their seine, containing a large school of menhaden. One man from a small boat is holding a portion of the cork-line to prevent the fish from jumping it; two others are reducing the size of the net by drawing it into the boat, while the remainder of the crew are pulling on the purse-line. Size, 30 by 54 inches.

CAST-NETS.

Mullet cast-nets.

Bait cast-nets.

Casting-net. Diameter, $4\frac{1}{2}$ feet. 25,046. William E. Hooper & Sons, Baltimore, Md.

Mullet cast-net. Diameter, $5\frac{1}{2}$ feet, $1\frac{1}{2}$-inch mesh. 26,799.

Shrimp cast-net. Diameter, $1\frac{1}{2}$ feet, $\frac{3}{4}$-inch mesh. 26,800.

LIFTING NETS.

LOBSTER-NET. (Model.)

A hoop-net, with cross-hoops on top; hook for bait; warp and float. Diameter, $6\frac{1}{2}$ inches. U. S. Fish Commission. 26,592.

LOBSTER-NET.

Home-made. A crude net, rigged with a common iron barrel-hoop; wooden bows, with bait-hook suspended. New Bedford, Mass., 1882. 56,944. Gift of Benjamin Baker, 2d. This style of net is made and used by longshoremen and boys for fishing from the wharves, &c.

LOBSTER-NET.

Full size; an iron hoop, 3 feet diameter; rigged with tanned netting, 2-inch mesh; wooden bow on top. Rockport, Me., 1882. 54,428. U. S. Fish Commission.

OPEN CUNNER-NET.

A funnel-shaped net, rigged on two iron hoops 25 and 34 inches in diameter; ring for bait in center. Gloucester, Mass., 1878. 32,710. Collected by G. Brown Goode. These nets are baited with codfish heads or other bait, and used in the capture of cunners (*Tautogolabrus adspersus*).

FOLDING CUNNER-TRAP.

An iron hoop, 3 feet in diameter, with second hoop hinged to it and folding in two parts over it, covered with netting. A small hoop, 15 inches in diameter, near bottom of net. Gloucester, Mass., 1878. 32,711. Collected by G. Brown Goode. This kind of trap is used chiefly by the Irish boat-fishermen of Boston in the capture of cunners (*Tautogolabrus adspersus*) for the Boston market.

19. PARTS OF NETS, APPARATUS OF MANUFACTURE, AND NET PRESERVATIVES.

ACCESSORIES TO PURSE-SEINES.

DAVIT-IRON.

Made of galvanized iron. Used in Cape Ann seine-boats. The purse-blocks hook into it. Middletown, Conn. 25,166. Wilcox, Crittenden & Co.

SNATCH-BLOCK FOR PURSE-SEINES.

Made of galvanized iron. Used on seine-boats for pursing mackerel and mehaden seines. Gift of Higgins & Gifford. 25,179.

SEINE-BLOCK.

Brown's patent. Made of galvanized iron. Used on seine-boats for pursing the mackerel-seine. Middletown, Conn. 29,432. Wilcox, Crittenden & Co.

SEINE-BOAT BLOCK.

Made of galvanized iron. The first style of metallic seine-boat block used at Gloucester, Mass. Middletown, Conn. 29,462. Wilcox, Crittenden & Co.

PURSE-SEINE BLOCK.

Original design of Merchant's patent, 1882. A galvanized-iron block, oval shell, single sheave. Gloucester, Mass., 1882. 54,321. Made by Wilcox, Crittenden & Co. This purse-block,

PURSE-SEINE BLOCK—Continued.

the improved pattern of which is shown in another place, was intended to take the place of lead rings at the foot of mackerel-seines.

SEINE-BLOCK.

Made of galvanized iron. In general use along the New England coast for pursing the mackerel-seine. Varies slightly from the Higgins & Gifford or Cape Ann pattern, and meets with about the same favor. Middletown, Conn. 54,711. Wilcox, Crittenden & Co.

IMPROVED SEINE-BLOCK.

Used in connection with purse-seines. Exhibited by Bagnall & Loud, Boston, Mass.

SEINE-POCKET BECKETS.

Two rings of galvanized iron joined together. Wilcox, Crittenden & Co. 54,318, 54,319. Used for coupling the seine to the pocket while the mackerel are being turned into the pocket. The original wooden pattern, designed by Capt. George Merchant, of Gloucester, Mass., is also shown.

SEINE PURSE-RINGS.

Series of five patterns of galvanized iron and copper rings. Gloucester, Mass., 1880–'82. 54,555. Gift of Capt. George Merchant, jr. These rings are fitted on the foot of a mackerel-seine and the pursing line passes through them. The smallest ring was the common size in 1854, the largest ones are those still in use.

SEINE PURSE-RING.

Series of galvanized iron and brass rings, round and oval shape, used on purse-seines in different parts of the New England coast. Wilcox, Crittenden & Co. 54,323.

SEINE PURSE-RING.

Beaman's patent. Made of brass, with roller, to prevent chafing of the purse-line. Wilcox, Crittenden & Co., 1882. 54,317. Salt water easily corrodes this ring, making it generally unsuitable for use on seines; it is sometimes used on Gloucester vessels for the clew-line of the gaff topsail.

NETTING.

UNTANNED NETTING.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{6}$C; size of mesh, $\frac{1}{2}$ inch. Made by H. & G. W. Lord, Boston, Mass. 54,556. Used by amateurs in all parts of the United States for small dip-seines and dip-nets to capture shiners and minnows for pickerel bait.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{6}$C; size of mesh, $\frac{3}{4}$ inch. Made by H. & G. W. Lord, Boston, Mass. 54,557. Used in all parts of the United States for haul-seines, 10 to 15 feet long by 3 to 5 feet deep, for catching small fish for bait, and also for dip-nets.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{9}$C; size of mesh, 1 inch. Made by H. & G. W. Lord, Boston, Mass. 54,558. Used in Maine and the British Provinces principally for haul-seines, 15 to 25 fathoms long by 12 to 15 feet deep, for the capture of smelts and sardines.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{12}$C; size of mesh, $1\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,559. Used chiefly in the British Provinces for haul-seines and traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{9}$C; size of mesh, $1\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston Mass. 54,560. Used in many parts of the United States for haul-seines for capelin and traps for herring.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{12}$C; size of mesh, $1\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,561. Used in New England for pounds and traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{9}$C; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,562. Used in New England for bunts of mackerel purse-seines, and in the Southern States for purse-seines for small menhaden.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,563. Used for pound-cribs, mackerel-seine pockets, mackerel-seine, scoop-nets, and dip-nets.

WHITE NETTING.

Cotton; quality of twine, $\frac{16}{6}$H; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,564. Used for wings of seines and for mackerel purse-seines set in shoal water.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{9}$; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,565. Used in New England for middles of small purse-seines for mackerel, and in Maryland and Virginia for wings of mendaden purse-seines.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{12}$; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,566. Used in New England mostly for bunts of mackerel purse-seines, and in Southern States for menhaden seines.

WHITE NETTING.

Cotton; quality of twine, $\frac{6}{6}$H; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,567. Used near the bunts and sometimes for the whole wings of mackerel purse-seines, and for herring gill-nets.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{6}$H; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,568. Extensively used for wings of mackerel purse-seines.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{12}$C; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,569. Used for bunts of mackerel purse-seines, and for small haul-seines for perch and other fish in rivers and ponds.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{16}$S; size of mesh, $2\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,570. Used on the Western Lakes for white fish and trout pound-traps, and on the Atlantic coast for fish-traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{12}$S; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,572. Used for drag-seines, pounds, and traps, and bunts of menhaden purse-seines.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,573. Used for capelin-seines, wings of haul-seines, and on Long Island and New Jersey coast for middles of menhaden purse-seines.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,574. Used for pounds, traps, fyke-nets, and all kinds of drag and haul seines.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,575. Very generally used for fish pounds and traps in all parts of the United States.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,576. Used in the United States for cribs of pounds and traps, and in Nova Scotia for bunts of cod-seines.

WHITE NETTING.

Cotton: quality of twine, $\frac{12}{21}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,577. Not much sold now, but formerly used for pounds and traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{20}{6}$H; size of mesh, $2\frac{3}{8}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,571. Used in the United States and the British Provinces for herring gill-nets.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $2\frac{5}{8}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,578. Used on the Long Island coast for centers of menhaden purse-seines, and on the Carolina coast for leaders to shad and other fish-traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{12}$S; size ot mesh, $2\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,579. Used on the Western Lakes for haul-seines, and pounds and traps for whitefish and trout.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, 3 inches. Made by H. & G. W. Lord, Boston, Mass. 54,580. Used for wings of drag and haul seines, light leaders for turning fish into traps, and for stop-nets.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 3 inches. Made by H. & G. W. Lord, Boston, Mass. 54,581. Not much sold now, but formerly used for wings of haul-seines and other netting purposes.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, 3 inches. Made by H. & G. W. Lord, Boston, Mass. 54,582. Used in Nova Scotia for hearts and leaders of pounds and traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, $3\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,583. Used on the Western Lakes and in the British Provinces for pounds and traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $3\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,584. Used on the Western Lakes and in the British Provinces for pounds and traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, 4 inches. Made by H. & G. W. Lord, Boston, Mass. 54,585. Used for cod-seines in Newfoundland, and in the United States for whitefish traps and bluefish gill-nets.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $4\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,586. Not much sold now, but formerly used for leaders to pounds and traps.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 5 inches. Made by H. & G. W. Lord, Boston, Mass. 54,587. Used for drag-seines and bluefish gill-nets.

WHITE NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 6 inches. Made by H. & G. W. Lord, Boston, Mass. 54,588. Used for leaders to many kinds of pounds and traps.

SERIES OF SAMPLES OF GILL-NETTING.

One piece, 300 yards long, $2\frac{1}{2}$-inch mesh, 9-thread half patent-laid twine, colored red.

One piece, 300 yards long, $2\frac{1}{2}$-inch mesh, 9-thread half patent-laid twine, colored blue.

One piece, 1,000 yards long, 3-inch mesh, 12-thread half-patent twine.

One piece, 300 yards long, 3-inch mesh, 18-thread half-patent twine.

One piece, 100 yards long by 150 meshes deep, $2\frac{1}{2}$-inch mesh, 14–6 hawser twine.

One piece, 100 yards long by 150 meshes deep, 2-inch mesh, 9 half patent twine.

One piece, 100 yards long by 150 meshes deep, 2-inch mesh, 6 half-patent twine.

One piece, 100 yards long by 100 meshes deep, 3-inch mesh, 12 half-patent twine.

One piece, 100 yards long by 150 meshes deep, $2\frac{1}{2}$-inch mesh, 10–4 hawser twine.

One piece, 100 yards long by 150 meshes deep, $2\frac{1}{4}$-inch mesh, 20–5 hawser twine.

SERIES OF SAMPLES OF GILL-NETTING—Continued.

One piece, 100 yards long by 150 meshes deep, $2\frac{5}{8}$-inch mesh, 20–12 cable twine.

One piece, 100 yards long by 150 meshes deep, 3-inch mesh, 20–9 cable twine.

One piece, 100 yards long by 150 meshes deep, $2\frac{1}{2}$-inch mesh, 15–9 half-patent twine. Exhibited by the American Net and Twine Company, Boston, Mass.

TANNED NETTING.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{6}$C; size of mesh, $\frac{3}{4}$ inch. Made by H. & G. W. Lord, Boston, Mass. 54,589. Used for small haul-seines, 10 to 15 feet long by 3 to 5 feet deep, to capture minnows for bait, and for bags and dip-nets.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{9}$C; size of mesh, 1 inch. Made by H. & G. W. Lord, Boston, Mass. 54,590. Used in Maine and the British Provinces for haul-seines to capture smelts and sardines.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{12}$ C; size of mesh, $1\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,591. Used in Maine and the British Provinces for haul-seines and traps for smelts.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $1\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,592. Used for capelin haul-seines and very generally for netting purposes.

TANNED NETTING.

Cotton; quality of twine, $\frac{16}{6}$H; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,593. Used chiefly for wings of small purse-seines for mackerel.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,594. Used for haul-seines, bunts of mackerel purse-seines, and wings of menhaden purse-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,595. Used for pound-cribs, mackerel seine-pockets, and mackerel scoop and bail nets.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{12}$C; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,597. Used chiefly for bunts of mackerel purse-seines, and sometimes in Virginia for menhaden purse-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,598. Very generally used for herring and mackerel traps, bunts of seines, and for fyke-nets, &c.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,599. Very generally used, especially for haul-seines, fyke-nets, and cribs for herring and mackerel pounds and traps.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{16}$; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,600. Very generally used, especially for haul-seines, drag-seines, fyke-nets, and cribs for herring and mackerel pounds and traps.

TANNED NETTING.

Cotton; quality of twine, $\frac{16}{6}$H, size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,601. Used for herring gill-nets and wings of mackerel purse-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{6}$H; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,602. Extensively used for herring gill-nets and wings of mackerel purse-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{12}$H; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,603. Used for bunts of mackerel purse-seines and for the small haul-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{21}$; size of mesh, $2\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,604. Used along the Atlantic coast for fish traps and pounds.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{6}$H; size of mesh, $2\frac{3}{8}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,605. Very generally used in the United States and the British Provinces for herring gill-nets.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,606. Very common size in use along the Atlantic coast for wings of haul-seines, around the bunts of mackerel purse-seines, and for capelin-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,607. Used for pounds and traps, drag-seines, haul-seines, and fyke-nets.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,608. Used for cribs of pounds and sometimes for bunts of Newfoundland cod-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{16}$S; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,609. Very generally used for pounds, traps, and seines of all kinds.

TANNED NETTING.

Cotton; quality of twine, $\frac{20}{12}$C; size of mesh, $2\frac{5}{8}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,610. Used on the coasts of Long Island and New Jersey for menhaden purse-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 3 inches. Made by H. & G. W. Lord, Boston, Mass. 54,611. Used in all parts of the United States, especially for trap-leaders and wings of haul-seines.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{16}$S; size of mesh, 3 inches. Made by H. & G. W. Lord, Boston, Mass. 54,612. Very generally used for pounds and traps in New England and on the Great Lakes.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, $3\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,613. Very generally used for pounds and traps in New England and on the Great Lakes.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $3\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,614. Used for pounds and traps in New England and on the Great Lakes.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, 4 inches. Made by H. & G. W. Lord, Boston, Mass. 54,615. Used for pounds and traps in New England and on the Great Lakes.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, $4\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,616. Used in the United States and the British Provinces for trap-leaders, cod-seines, and bluefish gill-nets.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $4\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,617. Sometimes used for pounds and traps.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 5 inches. Made by H. & G. W. Lord, Boston, Mass. 54,618. Used for drag-seines, trap-leaders, and bluefish gill-nets.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 6 inches. Made by H. & G. W. Lord, Boston, Mass. 54,619. Used chiefly on the Great Lakes for trap-leaders.

TANNED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, 6 inches. Made by H. & G. W. Lord, Boston, Mass. 54,620. Used chiefly on the Great Lakes for trap-leaders.

SERIES OF SAMPLES OF TANNED GILL-NETTING.

One piece 2-inch mesh, 20–6 hall twine.
One piece 2-inch mesh, 9-thread half patent-laid twine.
One piece 2-inch mesh, 18-thread half patent-laid twine.
Exhibited by the American Net and Twine Company, Boston, Mass.

TARRED NETTING.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{9}$C; size of mesh, 1 inch. Made by H. & G. W. Lord, Boston, Mass. 54,621. Used in Maine and the British Provinces for haul-seines and traps for the capture of smelts, small herring, and sardines.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{12}$C; size of mesh, $1\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,622. Used in Nova Scotia for bags and pockets of smelt-nets. The laws of that province require those nets to be not less than $1\frac{1}{4}$-inch mesh.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $1\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,623. Used in the United States and the British Provinces for herring traps and haul-seines for herring and capelin.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, $1\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,624. Used for pounds and traps for herring and mackerel.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{24}$; size of mesh, $1\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,625. Used chiefly for scoop-nets and bail-nets for dipping fish from seines and traps.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,626. Used for herring-seines, bunts of mackerel purse-seines, and on the Southern coast for menhaden purse-seines.

TARRED NETTING.

Cotton; quality of twine, $\frac{16}{6}$H; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,627. Used for wings of small-size purse-seines for mackerel.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{9}$C; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,628. Used for wings of menhaden purse-seines on Maryland and Virginia coasts, and for shoal-water purse-seines for mackerel.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{12}$C; size of mesh, $1\frac{3}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,629. Used for menhaden purse-seines and bunts of mackerel purse-seines.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,630. Very generally used for fyke-nets, herring-traps, and bunts of mackerel purse-seines.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,631. Used chiefly for traps and pounds, haul-seines, drag-seines, and fyke-nets.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,632. Used in the United States and Canada for traps, pounds, haul-seines, and drag-seines for the capture of all kinds of fish.

TARRED NETTING.

Cotton; quality of twine, $\frac{16}{6}$H; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,633. Used for wings and near the bunts of mackerel purse-seines.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{6}$H; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,634. Used for wings of mackerel purse-seines.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{12}$H; size of mesh, 2 inches. Made by H. & G. W. Lord, Boston, Mass. 54,635. Used for bunts of mackerel purse-seines, and small haul-seines for perch and herring in rivers and ponds.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, $2\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,636. Used for fish-traps on the Atlantic coast, and for cribs of pound-traps on the Great Lakes.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{16}$S; size of mesh, $2\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,637. Used chiefly for haul-seines and cribs of pounds.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{6}$H; size of mesh, $2\frac{3}{8}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,638. In general use for herring gill-nets.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,639. In general use for wings of haul-seines, middles of menhaden purse-seines on the New Jersey coast, and for capelin-seines.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,640. In general use for pounds and traps, and seines of all kinds.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{16}$ S; size of mesh, $2\frac{1}{2}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,641. Used for pounds and traps, and seines of all kinds.

TARRED NETTING.

Cotton; quality of twine, $\frac{20}{12}$ C; size of mesh, $2\frac{5}{8}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,642. Used on the New York and New Jersey coasts for menhaden purse-seines.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, 3 inches. Made by H. & G. W. Lord, Boston, Mass. 54,643. Used in the United States and the British Provinces for hearts and leaders of weirs and traps.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{9}$; size of mesh, 3 inches. Made by H. & G. W. Lord, Boston, Mass. 54,644. Used for stop-nets, wings of haul-seines and drag-seines, and light leaders for turning fish into pockets.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, $3\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,645. Used on the Great Lakes and in the British Provinces for pounds and traps.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{15}$; size of mesh, 4 inches. Made by H. & G. W. Lord, Boston, Mass. 54,646. Used for bluefish drag-nets and gill nets, pound leaders on the Great Lakes, and for cod purse-seines at Newfoundland.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{16}$; size of mesh, 4 inches. Made by H. & G. W. Lord, Boston, Mass. 54,647. Used for bluefish drag-nets and gill-nets, pound leaders on the Great Lakes, and cod purse-seines at Newfoundland.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{18}$; size of mesh, 4 inches. Made by H. & G. W. Lord, Boston, Mass. 54,648. Sometimes used for fish weirs.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, $4\frac{1}{4}$ inches. Made by H. & G. W. Lord, Boston, Mass. 54,649. Used in the United States and the British Provinces for bluefish gill-nets, cod-seines, and trap leaders.

TARRED NETTING.

Cotton; quality of twine, $\frac{12}{12}$; size of mesh, 5 inches. Made by H. & G. W. Lord, Boston, Mass. 54,650. Used in the United States and the British Provinces for blue-fish gill-nets, drag-seines, and trap leaders.

NETTING.

Samples of various kinds of seine and gill-net webbing manufactured by the Baltimore Net and Twine Company. Exhibited by William J. Hooper's Sons, Baltimore, Md.

TWINE USED IN THE MANUFACTURE OF NETTING.

Samples of twine exhibited by American Net and Twine Company, Boston, Mass. One bundle each of 6, 9, 12, 15, 18, 21, 24, 27, 30, and 36 threads, half patent (bundles not papered). One bundle, half patent (papered). Two bundles each of 20–6 and 20–12 hall twine, and 20–6 and 20–9 cable-laid twine. (One bundle of each kind papered and one unpapered.) Two sample boards of patent-laid, soft-laid, and net twines.

NET-MAKER'S TOOLS.—NET-NEEDLES, MESH-BOARDS, ETC.

USED IN MAKING AND REPAIRING NETS AND SEINES. PATTERNS USED ON THE COAST OF NEW ENGLAND.

TWINE-MESHING NEEDLE.

Used for doubling the twine on the border of a seine-web that comes next to the rope on all sides.

SEINE-HANGING NEEDLE.

For mackerel purse-seines, filled with 32-thread twine.

NET-MENDING NEEDLE.

For cod gill-nets.

NET-MENDING NEEDLE.

Made of brass.

NET-MENDING NEEDLE.

Made of sperm whale's jaw.

MESH-BOARD FOR MENHADEN GILL-NETS

Three and one-half inch mesh.

MESH-BOARD FOR MENHADEN GILL-NETS

Three and three-fourths inch mesh.

MESH-BOARD FOR HERRING GILL-NETS.

Two and one-half inch mesh.

MESH-BOARD FOR COD GILL-NETS.

Seven and three-fourths inch mesh.

MESH-BOARD FOR COD GILL-NETS.

Eight and one-half inch mesh.

MESH-BOARD FOR COD GILL-NETS.

Eight and three-fourths inch mesh.

MESH FORMER FOR COD GILL-NETS.

Nine and one-half-inch mesh.

MESH-BOARD FOR MACKEREL GILL-NETS.

Three-inch mesh.

ABORIGINAL NET-MAKING IMPLEMENTS.

MESH MEASURES. (7.)

Wood or bone. A short blade of the size of the desired mesh, and handle of convenient length for grasping. Length, 5 to 10 inches. Bristol Bay, Alaska, 1882. 55,915. Collected by Chas. L. McKay.

NET-TWINE REELS. (7.)

Wood or bone, shaped much like modern seine or netting-needles. Length, $6\frac{3}{8}$ to 13 inches; width, $\frac{1}{2}$ to $1\frac{3}{8}$ inches. Bristol Bay, Alaska, 1882. 55,913. Collected by Chas. L. McKay. The net stitch or knot for making the mesh was known to the aborigines of the northwest coast of America before the advent of white men.

ESKIMO NETTING-NEEDLES.

Seine-needle. Eskimo. Northeastern America. S. F. Baird. 9,839.
Seine-needle. Magemut Eskimo, Nunivak Island, Alaska. W. H. Dall. 16,202.
Seine-needle of wood. Yukon River. W. H. Dall. 5,613.
Needle of bone. Norton Sound Eskimo. W. H. Dall. 5,614.
Seine-needles of bone. Magemut Eskimo. Nunivak Island. W. H. Dall. 16,166 to 16,171, 16,196.
Seine-needles of wood. Chirikoff. W. H. Dall. 1,180.
Netting-needle. Eskimo. Smithsonian Institution. 1,315.
Seine-needles of bone. Eskimo of northeastern America. S. F. Baird. 9,839.

PHOTOGRAPHS ILLUSTRATIVE OF THE MANUFACTURE OF NETS.

NET FACTORY.

Photographic view of room containing knitting-machine and bobbin-fillers at the factory of H. & G. W. Lord. Size, 8 by 10 inches. Boston, Mass., 1882. (435) 2,005. U. S. Fish Commission.

NET FACTORY.

Photographic view of loom-room in the net factory belonging to H. & G. W. Lord. Size, 8 by 10 inches. Boston, Mass., 1882. (423) 1,999. U. S. Fish Commission.

NET FACTORY.

Photographic view of knitting-machine room in the net factory belonging to H. & G. W. Lord. Size, 8 by 10 inches. Boston, Mass., 1882. (421) 1,998. U. S. Fish Commission.

NET FACTORY.

Photographic view of hanging-room in the net factory belonging to H. & G. W. Lord. Size, 8 by 10 inches. Boston, Mass., 1882. (420) 1,997. U. S. Fish Commission.

NET FACTORY.

Photographic view of the finishing-room in the net factory belonging to H. & G. W. Lord. Size, 8 by 10 inches. Boston, Mass., 1882. (418) 1,996. U. S. Fish Commission.

NET FACTORY.

Photographic view of room containing knitting-machine and bobbin-fillers at the factory of H. & G. W. Lord. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Boston, Mass., 1882. (435) 2,005. U. S. Fish Commission.

NET PRESERVATIVES.

LIQUID PRESERVATIVES.

Nelson's liquid-compound, used for preserving canvas, manila rope, and netting. Also samples of canvas, rope, and netting which have been treated with the fluid. Patented and exhibited by Chresten Nelson, Gloucester, Mass.

PHOTOGRAPHS ILLUSTRATIVE OF THE PRESERVATION OF NETS.

NET-TARRING MACHINE.

Photograph showing apparatus used at Church Brothers' menhaden oil and guano factory for tarring purse-seines to be used in the menhaden fishery. Acid wharf in background. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Tiverton, R. I., 1882. (400) 1,983. U. S. Fish Commission.

NET TANNING AND TARRING MACHINE.

Photographic view of machine used by H. & G. W. Lord in tanning and tarring nets made at their factory. Size, 8 by 10 inches. Boston, Mass, 1882. (425) 2,001. U. S. Fish Commission.

NET-TARRING MACHINE.

Photograph of apparatus used at Church Brothers' menhaden oil and guano factory for tarring purse-seines to be used in the menhaden fishery. Acid wharf in background. Size, 8 by 10 inches. Tiverton, R. I., 1882. (400) 1,983. U. S. Fish Commission.

TANNING NETS.

Photographic view of tanning room in the net factory belonging to H. & G. W. Lord. Size, 8 by 10 inches. Boston, Mass., 1882. (424) 2,000. U. S. Fish Commission.

D.—APPARATUS ENTIRELY AUTOMATIC.

VI.—TRAPS.

20. PEN TRAPS.

POCKET TRAPS.

FISH-SLIDE OR TRAP.

Model, scale 1 inch to the foot. Made of wooden slats set in a sloping frame, with box at upper end. Length, 10 inches; width, 4¼ inches. James River, Virginia, 1876. 25,831. Gift of J. G. Adam. "The fish slides in the Roanoke River, North Carolina, are solid and substantial structures built of timber, and are placed in the strongest currents just below the falls. The shad, seeking the headwaters of the stream in endeavoring to find their way above the falls, get into the currents and are at once washed upon the screen of the slide, which slants upward from the bottom of the river. The power of the current effectually prevents their return, and they are easily secured, either in the box or on the screen of the slide."

FISH-SLIDE OR TRAP.

Model, scale 1 inch to the foot. A series of wooden slats set in a sloping frame. Length, 10 inches; width, 4½ inches. James River, Virginia 1876. 25,830. Gift of J. G. Adam. "A slide of this kind is set in the current of a shallow stream, its upper surface raised from the bottom at an angle of 25 to 30 degrees, the lower edge, which comes in contact with the water, facing up stream, and the top edge reaching above the water."

FISH-TRAP OR SLIDE.

Model. Made of wooden slats in three series, each 8 inches long, set in frame. Charlottetown, Md., 1877. 57,045. Gift of J. B. Graham.

LABYRINTH TRAPS.

FUNNEL TRAPS WITHOUT WINGS OR LEADERS.

Fish-traps.

FISH-TRAP.

Made of fine splints; cone-shape; two funnels. Length, 5 feet; diameter at large end, 14½ inches. Baltimore, Md., 1880. 56,946. U. S. Fish Commission. Used in Cheaspeake Bay and adjacent waters.

FISH-TRAP.

Model. Made of spruce-root splints; cone-shape; one funnel. Length, 25½ inches; diameter at large end, 7½ inches. Bristol Bay, Alaska. 55,899. Collected by C. L. McKay.

FISH-TRAP.

Model. Made of spruce-root splints; cone-shape; one funnel. Length, 20 inches. Yukon Island, Alaska. 49,062. Collected by E. W. Nelson.

FISH-TRAP.

Full size; made of small branches of willow tied together with Manila yarn; half-round shape; funnel at large end. Length, 44 inches; width at large end, 19 inches. Indians of California, 1880. 39,496. Collected by Prof. D. S. Jordan.

WICKER FISH-POT.

Used by the Indians of California. Vicinity of San Francisco. Prof. D. S. Jordan. 39,474.

FISH-TRAP.

Model. Made of spruce-root splints; cone-shape; one funnel. Length, 18 inches; diameter at large end, 6 inches. Norton Sound, Alaska. 32,987. Collected by E. W. Nelson.

WICKER FISH-POT.

Model, scale 1 inch to foot. Made of soft-wood splints; heart-shape. St. Martin's, West Indies. 1,754. Collected by H. O. Claughton, U. S. A. Used at Southern Florida and the West Indies for fishing in from five to fifteen fathoms of water.

SPRUCE-ROOT SPLINTS.

Used by natives of Alaska in making fish-traps. Lower Yukon River, Alaska. 49,095. Collected by E. W. Nelson.

WHITE-OAK SPLINTS.

Cut in thick and thin strips about four feet long; used for making eel-pots. Vineyard Haven, Mass., 1876. 25,017. Gift of Capt. Josiah Cleveland.

WICKER EEL-POT.

Three funnels. Used about Martha's Vineyard. Vineyard Haven, Mass. 25,014 (a). Capt. Josiah Cleveland, maker.

EEL-TRAP.

Full size; made of wooden slats; three compartments; entrance at either end, made of cotton socks. Length, 43 inches; width,

EEL-TRAP—Continued.

12 inches; depth, 12 inches. Essex, Mass., 1882. 56,948. U. S. Fish Commission. This style of trap is set in Essex River in the spring of the year. It is baited with broken clams and sunk by bricks; from forty to fifty pounds of eels are frequently taken in a single trap on one tide.

EEL-TRAP.

Full size; made of white-oak splints; bottle shape; two funnels. Length, 6 feet; diameter at large end, 17 inches. Vineyard Haven, Mass., 1876. 25,014. Made by Capt. Josiah Cleveland. Used about Martha's Vineyard in from three to ten fathoms of water.

EEL-POT.

Full size; made of white-oak splints; bottle shape; has two funnels. Length, 6 feet; diameter at large end, 17 inches. Vineyard Haven, Mass., 1876. 25,015. Made by Capt. Josiah Cleveland. Used about Martha's Vineyard in from three to ten fathoms of water.

EEL-POT.

Model, half size. Made of white-oak splints; bottle shape; one funnel. Length, 20 inches; diameter at wide end, 9 inches. Noank, Conn., 1876. 25,019. Gift of James H. Latham. Used in Fisher's Island Sound and vicinity.

EEL POT.

Model, half-size. Made of white-oak splints; bottle shape; one funnel; warp and float attached. Length, 20 inches; width at large end, 9 inches. Noank, Conn., 1876. 56,947. Gift of James H. Latham. Used in Fisher's Island Sound and vicinity.

EEL-TRAP.

Model. Shape of barrel; holes in staves; entrance at one end; opening on side; slung with lines. Height, 9 inches. Washington, D. C., 1883. 56,949. Gift of George Woltz. Used in the Potomac River at Washington and vicinity.

EEL-POT NET.

Model. Series of iron hoops, 9½ inches in diameter, connected by netting; two funnels. Length, 23 inches. New York, 1877. 29,530. Gift of American Net and Twine Co. Used on coasts of Long Island and New Jersey.

Lobster pots.

LOBSTER POT.

Full size; made of laths, in shape of half cylinder; netting at ends; granite sinkers; warp and buoy. Length, 4 feet; width, 27 inches; depth, 17 inches. Rockport, Mass., 1882. 54,482. U. S. Fish Commission. The most common style of lobster trap used in Massachusetts Bay.

DOUBLE-ENDER LOBSTER POT.

Full size; made of laths, in shape of half-cylinder; netting at ends; three compartments; brick sinkers; warp and float. Length, 7 feet 3 inches; width, 26 inches; depth, 19 inches. Rockport, Me., 1882. 54,430. U. S. Fish Commission.

LOBSTER POT.

Full size; made of laths, in shape of half cylinder; netting at ends; brick sinkers; warp and buoy. Length, 4 feet; width, 2 feet; depth, 18 inches. Rockport, Me., 1882. 54,429. U. S. Fish Commission. The most common style of trap used on the Maine coast.

LOBSTER POT.

Model. Made of wooden slats, in shape of half-cylinder; stone sinkers; warp and float. Length, 16 inches; width, 7½ inches; depth, 6½ inches. Stonington, Conn., 1878. 29,363. Gift of N. G. Smith.

LOBSTER POT.

Model. Made of wooden slats, in half-cylinder shape, with netting at ends; stone sinkers; warp and float. Length, 12 inches; width, 6 inches; depth, 5 inches. Noank, Conn., 1878. 29,296. Gift of G. L. Green.

LOBSTER POT.

Model. Made of wooden slats, in shape of half-cylinder, with netting at ends; stone sinkers; warp and float attached. Length, 9 inches; width, 5 inches; depth, 3½ inches. Boston, Mass., 1877. 26,586. Gift of Johnson & Young.

LOBSTER POT.

Model, scale, 3 inches to foot. Made of wooden slats, square shape; stone sinkers; warp and float. The full-size pot of this style is 26 inches square by 13 inches deep. Newport, R. I., 1875. 24,801. Gift of J. M. K. Southwick. Used in Narragansett Bay for fishing in water from 10 to 15 fathoms deep.

LOBSTER-POT BAIT-HOOKS OR BOBS.

Two hooks of galvanized iron; one curved and the other straight shank. Length, 5 and 13½ inches. Provincetown, Mass., 1878. 29,473. Gift of Isaiah A. Small. These styles of hooks are used in the ordinary half-cylinder lobster-pots, baited with fish-heads or refuse fish.

LOBSTER-POT.

Small wooden model of a lobster-pot used on the south coast of Massachusetts. Exhibited by Benjamin Baker 2d. New Bedford, Mass.

FUNNEL-TRAPS WITH WINGS OR LEADERS.

EEL WEIR AND POT.

Two funnels 22 inches long, with wings and leaders. Vineyard Haven, Mass., 1875. 24,885. Made by Captain Josiah Cleveland.

WICKER EEL-POT.

Two funnels with leaders. Used about Martha's Vineyard, in 3 to 10 fathoms. Vineyard Haven, Mass. 25,015, 25,016. Captain Josiah Cleveland, maker.

FISH-TRAP.

Model. Made of spruce-root splints; cone-shape; one funnel and leaders. Length, 16 inches. Norton Sound, Alaska. 32,988. Collected by E. W. Nelson.

Fyke-nets.

FYKE-NET.

Full size. Made with five cedar hoops from 30 to 40 inches in diameter; white cotton netting, 2½ and 3 inch mesh; leaders, 80 feet long and 4 feet deep; wings, 16 feet long. Noank, Conn., 1883. 57,066. U. S. Fish Commission. Style of net used along the New England coast for the capture of flounders, blackfish, shad, and other species.

MINNOW-FYKE.

Model. Made of tanned cotton netting on three hoops with right and left wings. American Net and Twine Company. 26,113.

FYKE OR SET NET.

Made of netting, with six hoops from 10 to 17 inches in diameter. U. S. Fish Commission. 32,733.

Pounds and weirs.

ABORIGINAL FISH-WEIR.

Model of weir used by the aborigines of Virginia in the fifteenth century. Consists of four oblong bowls diminishing in size toward the outer end. Made of stakes and splints or brush, with right and left wings. Models of dugout-canoe, paddles, and dip-net. Length of bowls, 9, 7½, and 6 inches; wings, 11 inches long; canoe, 11 inches long. From figures in De Bry. 25,829. Gift of J. G. Adam.

FISH-TRAP.

Model: Wood, in three sections; the first, shaped like an elongated basket, with one open side; the second, something like a turtle's back; the third, a small box, with sides made of slats. Haidah Indians. Queen Charlotte Islands, British Columbia, 1883. 72,840. James G. Swan.

Section 1 is placed with the curved end up-stream, firmly secured to a stake. Section 2 is inserted and firmly tied to section 1, and forms the entrance to the trap. Section 3 is inserted in section 2 and secured; the fish, after swimming about in sections 1 and 2, are carried with the force of the current and their own momentum into this section, which floats on the water, from which the fish are easily taken.

HERRING-WEIR.

Model. Made with stakes driven into the bottom and wattle brush. Bunt of full-size weir 75 to 100 feet diameter, with right and left wings and leaders. Grand Manan. 26,746. Gift of W. B. McLaughlan. Used in the Bay of Fundy for the capture of herring (*Clupea harengus*).

BRUSH-WEIR.

Model; heart-shape, with leaders or wings. Made of brush held in position by upright stakes, fastened in bed-sills and ballasted. Diameter of bunt or bowl, 8 inches; wings, 10 inches long. Grand Manan, 1872. 26,731. Gift of W. B. McLaughlan. Used in the Bay of Fundy in the capture of herring (*Clupea harengus*).

BAR-WEIR.

Model, scale 1 inch to the foot. Made in lyre-shape, of upright stakes with splints between. Model of wharf at one end; gate or entrance of netting. Length, 30 inches; width at outer end, 12 inches. Eastport, Me., 1872. 12,102. Gift of Capt. U. S. Treat. Used in the Bay of Fundy herring fisheries.

SALMON-WEIR.

Model, scale 1 inch to 8½ feet. Heart-shape bowl and pocket; leader extending from mouth of weir; made of netting held in position by anchored stakes. Length of bowl or bunt, 2 feet; width, 6 inches; leaders, 15 inches long. Dennis River, Maine. 12,106. Collected by Prof. S. F. Baird.

POUND-NET OF LAKE MICHIGAN.

Model, scale 1 inch to 3½ feet. Made of netting and held in position by stakes driven into the bottom. The outer bowl, which is square, has netting on the bottom, and is hung to the stakes by rings so that it can be easily handled; inner bowl heart-shape, with no bottom, hung with rings to stakes. Outer bowl, 11 inches square; leaders, 13 inches long. Models of stake-driver, boat, dip-net, fish-house, with cleaning troughs, &c., also shown. Waukegan, Ill., 1876. 25,750. Gift of D. D. Parmalee.

BASS-TRAP.

Model, scale half-inch to foot. Made of netting held in position by driven stakes. Consists of two bowls, one rectangular and one heart-shape, with shore leader. Length without leader, 40 inches; leader, 24 inches long. Noank, Conn., 1876. 25,704. Gift of Charles T. Potter. Used in Peconic Bay and Fisher's Island Sound.

PHOTOGRAPHS AND DRAWINGS ILLUSTRATIVE OF THE TRAP-FISHERY.

HERRING-WEIR.

Photographic view of a brush-weir, locally known as "whirlpool weir," built for catching small herring to be sold as sardines in Eastport. The picture is taken at half-ebb tide, and shows a sandy beach, toward which the fish are drawn in a seine when the weir is being fished. Size, 8 by 10 inches. Deer Island, N. B., 1882. (199¾) 1,900. U. S. Fish Commission.

HERRING-WEIR.

Photographic view of a brush-weir, locally known as "Tinker's Island weir," built for catching small herring to be sold to the sardine canneries. The weir is shown at low water, with a sardine steamer, which is employed in carrying the fish to the factories, in the background. Size, 8 by 10 inches. Tinker's Island, near Eastport, Me., 1882. (150) 1876. U. S. Fish Commission.

HERRING-WEIRS.

Photographic view of a group of several herring-weirs built to supply the sardine canneries at Eastport with small herring and to catch large ones for smoking. Size, 8 by 10 inches. Sandy Island, near Eastport, Me., 1882. (228) 1,915. U. S. Fish Commission.

HERRING BRUSH-WEIR.

Photographic view of a brush-weir used in the capture of herring to be sold for bait to fishing vessels engaged in the off-shore New England cod fisheries. In the background is a Gloucester banker lying at anchor waiting till the weir has been fished to secure bait before starting for the off-shore fishing-grounds. Size, 8 by 10 inches. Sandy Island, near Eastport, Me., 1882. (224) 1,913. U. S. Fish Commission.

CHANNEL HERRING-WEIR.

Photographic view of a brush-weir built in a channel between two islands, which serve to direct the herring to the entrance of the weir. Size, 8 by 10 inches. Taken near Eastport, Me., 1882. (227) 1,914. U. S. Fish Commission.

HERRING BAR-WEIR.

Photographic view of a brush-weir, the mouth of which is closed by a bar, which is exposed at low tide, but covered to a depth of 12 to 15 feet at high water. The fish pass over the bar into the weir at high tide, where they remain until the tide ebbs, when they are prevented from escaping by the bar, which serves as a natural barrier. Size, 8 by 10 inches. Sandy Island, near Eastport, Me , 1882. (229) 1,916. U. S. Fish Commission.

BALLASTING A HERRING-WEIR.

Photograph of a portion of a ballasted herring-weir, taken at low-tide, to show the method adopted for holding a weir in position when placed upon rocky ground where poles cannot be embedded. Size, 8 by 10 inches. Sandy Island Ledges, near Eastport, Me., 1882. (223) 1,912. U. S. Fish Commission.

FISHING A HERRING-WEIR.

Photographic view of a brush-weir, locally known as the "gap weir," showing men engaged in "rolling in" herring into their boats by means of dip-nets. Sandy Island Ledges, near Eastport, Me., 1882. (221) 1,911. Size, 8 by 10 inches. U. S. Fish Commission.

SEINING HERRING-WEIR.

Photographic view of the interior of a herring-weir, showing the common method of fishing the weir by means of seines and

SEINING HERRING-WEIR—Continued.

dip-nets. Size, 8 by 10 inches. Sandy Island, near Eastport, Me. (147) 1,875. U. S. Fish Commission.

LOBSTER FISHING.

Photographic view of a row of buildings used by men engaged in trapping lobsters at Cape Ann, with boats, pots, and other fishing gear scattered along the beach, Size, 8 by 10 inches. Lane's Cove, Gloucester, Mass., 1882. (74) 1,837. U. S. Fish Commission.

LOBSTER FISHING.

Photograph of William Winn and Zebulon Parsons hauling lobster-pot from a dory; one holding the boat in position by means of the oars, while the other hauls the pot. This is the common method of hauling pots along the New England coast. Size, 8 by 10 inches. Taken at Rockport, Mass., 1882. (58) 1,830. U. S. Fish Commission.

FYKE-FISHING FOR FLOUNDERS.

Photograph of sloop Target, of Portland, lying at wharf, with boats alongside; showing men repairing fykes for engaging in the winter fishery for flounders in the shoal waters of the numerous islands of Casco Bay. The vessel serves as a home, workshop, and packing-house. Size, 8 by 10 inches. Taken at Portland, Me., 1882. (134) 1,869. U. S. Fish Commission.

MENDING FYKE-NETS.

Photograph showing crew of sloop Leader, of Portland, mending their fyke-nets, for the purpose of engaging in the winter flounder fisheries of that locality. The fykes have been spread out on the wharf for convenience in mending. The vessel is in the background, with other fykes hung in the rigging to dry. Size, 8 by 10 inches. Taken at Portland, Me., in 1882. (139) 1,873. U. S. Fish Commission.

HERRING-WEIR.

Photographic view of a brush-weir, locally known as "whirlpool weir," built for catching small herring to be sold as sardines in Eastport. The picture is taken at half-ebb tide, and shows a sandy beach, toward which the fish are drawn in a seine when the weir is being fished. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Deer Island, New Brunswick, 1882. (199¾) 1,900. U. S. Fish Commission.

HERRING-WEIRS.

Photograph showing a group of several herring-weirs built to supply the sardine canneries at Eastport with small herring, and

HERRING-WEIRS—Continued.

to catch large ones for smoking. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Sandy Island, near Eastport, Me., 1882. (228) 1,915. U. S. Fish Commission.

SEINING HERRING-WEIR.

Photographic view of the interior of a herring-weir, showing the common method of fishing the weir by means of seines and dip-nets. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Sandy Island, near Eastport, Me. (147) 1,875. U. S. Fish Commission.

LOBSTER FISHING.

Photograph showing a row of buildings used by men engaged in trapping lobsters at Cape Ann, with boats, pots, and other fishing gear scattered along the beach. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Lane's Cove, Gloucester, Mass., 1882. (74) 1,837. U. S. Fish Commission.

LOBSTER FISHING.

Photograph of William Winn and Zebulon Parsons hauling a lobster-pot from a dory; one holding the boat in position by means of the oars, while the other hauls the pot. This is the common method of hauling pots along the New England coast. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Taken at Rockport, Mass., 1,882. (58) 1,830. U. S. Fish Commission.

TRAP-FISHING FOR LOBSTERS.

Photograph of fishermen engaged in trapping lobsters about Nantucket Shoals, showing the shanty in which they make and repair their traps, with several traps and other apparatus in the foreground. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Edgartown, Mass., 1882. U. S. Fish Commission.

SALMON FYKE-FISHING.

An India-ink sketch of fyke-nets set in the shoal waters on the coast of Alaska, with leaders extending to the shore. Large quantities of salmon are taken in fykes in this way during the migratory season. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

MENDING FYKE-NETS.

Photograph showing crew of sloop Leader, of Portland, mending their fyke-nets for the purpose of engaging in the winter

MENDING FYKE-NETS—Continued.

flounder fisheries of that locality. The fykes have been spread out on the wharf for convenience in mending. The vessel is in the background with other fykes hung in the rigging to dry. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Taken at Portland in 1882. (139) 1,873. U. S. Fish Commission.

NORTH CAROLINA FISH-SLIDE.

An India-ink sketch of a fish-slide or sluice placed in the rapids of a river for catching fish. The bottom of the slide is made of open work to allow the water to pass through, the fish being caught by the current and carried into it, where they are secured by men who stand ready to catch them with dip-nets or spears. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

NORTH CAROLINA FISHING-WHEEL.

An India-ink sketch of a dam with a sluiceway in the center in which a fishing-wheel is set. The dam is so arranged as to throw all of the water through the sluiceway, and all fish descending the stream must naturally pass through it. The wheel is made of netting and has curved arms which answer as scoops. It is revolved by the force of the water which strikes against the arms, the fish being thrown into a box placed near to receive them. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

21. SPRING TRAPS.

ANIMAL TRAPS.

BEAR-TRAPS.

Made of whalebone strips bent and tied. Prepared by the Anderson River Eskimo. Mackenzie River district. 7,442. Collected by Robert MacFarlane. A bent piece of whalebone is placed in a piece of frozen fat, which when swallowed melts, allowing the bone to spring.

ANIMAL-TRAP.

Common steel trap, Hawley & Norton, No. 1 (New York). Used by whalemen in the Arctic regions for the capture (for their fur) of foxes and other small animals; length 31 inches, including chain. New London, Connecticut, 1882. Gift of C. A. Williams & Co. 57,799.

SPRING HOOKS.

SPRING HOOKS.

For pickerel fishing. 25,561.

SPRING HOOK, OR TRAP.

42,879.

SNAP AND CATCH'EM HOOKS.

For pickerel fishing. 42,879.

EAGLE-CLAW TRAP.

57,654.

PICKEREL-TRAPS.

Spring-trap, with lines, hooks, and flags, rigged for fishing through the ice. U. S. Fish Commission. (B. & A.) 25,562.

E.—ACCESSORIES TO FISHING.

VII.—DECOYS AND DISGUISES.

22. Natural and artificial baits.

(See above under modern hooks, decorated.)

23. Decoys.

SIGHT DECOYS.

FISH-LURES.

LURE-FISHES.

Used in fishing through the ice for pickerel. These lure-fishes are used to decoy large fish under holes in the ice so that they may be within reach of the spear. William Morris, Lake City, Mich. 29,294.

LURE-FISH.

Used in fishing through the ice for salmon-trout. D. H. Fitzhugh, Bay City, Mich. 29,366.

FISH-LURES.

Attractive artificial baits; wood, with small stone sinkers; used for the capture of various kinds of fish. Indian name, "Mark-te-waddi." Made by a Makah Indian at Neah Bay. (Large), length, 13½ inches, 72,646. (Small), length, 8 inches, 72.647. Makah Indians, Cape Flattery, 1883. James G. Swan. Are thrust into the water by means of a fish-spear, and rise to the surface with gyratory motions, attracting the fish from all directions, at which time the Indian either spears the fish or takes them with baited hooks. Common to the Indians of the Northwest coast.

TORCHES.

BIRCH-BARK.

Used for torchlight fishing. Passamaquoddy Indians. Eastport, Me. 12,107. Gift of Dr. E. Palmer.

TORCH-DRAGON.

An open-work basket of hoop-iron, having an iron handle 2 feet 10 inches long, which is attached to a wooden handle 3½ feet in length. Basket 18 inches long, 22 inches wide. Gloucester, Mass., 1883. 57,879. U. S. Fish Commission. In this a fire or blaze is built when torching sperling (small herring). The dragon is fastened to the bow of a boat—the basket with the blaze projecting—which is rowed swiftly to attract the fish that gather in the light end and are scooped in.

BOAT-LANTERNS.

Copper and glass; triangular, flat bottom, convex top, with ventilator at apex; lamp inside with two burners; width of lantern at back, 21 inches; each of the two sides 18 inches wide. Southern New England. 29,365. James H. Latham, Noank, Conn. Used in bow of boat in weequashing or spearing eels by night.

PHOTOGRAPHS ILLUSTRATIVE OF THE USE OF TORCHES IN THE CAPTURE OF FISH.

HERRING-TORCHING.

Photograph of a fishing crew engaged in "driving" herring. A fire of birch bark is blazing in the iron dragon at the bow, and a man stands ready with a dip-net for securing the herring which approach the light as the boat is rapidly rowed through the water by the other members of the crew. Size, 8 by 10 inches. Taken at Eastport, Me., 1882. (189) 1,894. U. S. Fish Commission.

HERRING-TORCHING.

Photograph of a fishing crew engaged in "driving" herring. A fire of birch bark is blazing in the iron dragon at the bow, and a man stands ready with a dip-net for securing the herring which approach the light as the boat is rapidly rowed through the water by the other members of the crew. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Taken at Eastport, Me., 1882. (189) 1,894. U. S. Fish Commission.

SOUND DECOYS.

THREE-CLAWED SEAL-DECOY.

Handle and prongs wood, tipped with the claws of the seal; claws seized tightly with seal sinew and lashed to an ivory peg rigidly fastened in the palm. Length, $10\frac{3}{4}$ inches. Ooglaamie, Alaska, 1882. 56,555. Collected by Lieut. P. H. Ray, U. S. A. Used by natives for scratching upon the ice or snow to attract the attention of seals.

FOUR-CLAWED SEAL-DECOY.

Handle and prongs of wood, tipped with seal claws; claws served with seal sinew and lashed to a rigid ivory peg in palm; becket of sealskin rove through a hole in the handle and knotted. Length, $8\frac{7}{8}$ inches. Ooglaamie, Point Barrow, Alaska, 1882. 56,557. Collected by Lieut. P. H. Ray, U. S. A. Used by natives for scratching upon the ice or snow to attract seals.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

K.

CATALOGUE

OF

FISHERY PRODUCTS, AND OF THE APPARATUS USED IN THEIR PREPARATION.

BY

A. HOWARD CLARK,

ASSISTANT IN THE DEPARTMENT OF ART AND INDUSTRY,
UNITED STATES NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

TABLE OF CONTENTS.

A.—INTRODUCTION.

	Page.
Total value of products	7
Value of principal fisheries	7
Imports and exports	8
The codfish industry	9
The mackerel industry	10
The menhaden industry	11
The smoked-fish industry	12
The salmon industry	12
The sardine industry	13
The shad and alewife fisheries	14
Sturgeon and caviare	14
Commercial fisheries of the Middle States	15
Commercial fisheries of the Southern States	15
The oyster industry	15
The clam industry	16
The lobster industry	16
The whale fishery	16
The fish-oil industry	17
The fur industry	17
Leather, ivory, and bone	18
Fish glue and guano	18

B.—METHODS OF PREPARATION.

I.—Preparation and Preservation of Food.

1. Preservation during life	20
Fish cars and floating cages	20
2. Preservation of fresh meats	21
Refrigeration	21
Photographs illustrating the fresh-fish industry	23
3. Preservation by drying	25
Sun-dried fish: appliances for preparing and packing	25
Photographs illustrating the preparation of sun-dried fish	28
Smoke-dried fish: appliances for preparing	30
Photographs illustrating the preparation of smoked fish	30
4. Preservation by brine-salting	31
Appliances used in preparing pickled fish	31
Photographs illustrating the preparation of pickled fish	33

Page

5. Preservation by canning 34
Models of canneries and canning tools 34
Cotton-seed oil and its preparation 34
Tin boxes used for canned goods 36
For products plain-boiled or fried 36
For products boiled with vegetables 49
For products canned in brine—with heat 51
For products canned in brine—without heat 51
For products canned in spices, sauces, &c 53
For products canned in vinegar 55
For products canned in oil 55
For products canned dry 56
Photographs illustrating the preparation of canned goods 58
6. Preservation by boiling 60
Apparatus for boiling lobs ers 60
7. Antiseptics for preserving fish: salt 60

II.—Preparation of Oils, Guano and Glue.

8. Whale-fishery products 60
Extraction of whale-oil and cleaning of whalebone 60
Photographs illustrating oil refining and storage of oil 60
9. Fish oils and guano 61
Menhaden oil and guano 61
Cod-liver oils 61
Photographs illustrating the preparation of fish oils and guano 62
10. Fish glue and isinglass 64
Photographs illustrating the manufacture of glue and isinglass 64

III.—Wharves, Markets, and Transportation.

11. Models and illustrations 64
Fish wharves 64
Transportation cans and kegs 64
Apparatus used in fish markets 65
Photographs illustrating fish wharves, &c 66

IV.—Patents Relating to Fishery Products.

12. Specifications and drawings; issued from 1834 to 1883 67

C.—ANIMAL PRODUCTS AND THEIR APPLICATION.

V.—Fishery Products Used for Food.

13. Foods in a fresh condition 69
14. Foods dried and smoked 69
Plain-dried and dry-salted preparations 69
Smoked preparations 75
15. Foods preserved by brine-salting 76
16. Foods preserved in cans 76
Plain-boiled 76
Boiled with vegetables 81
Canned in brine—with heat 82
Canned in brine—without heat 82
Canned in spices, sauces, marinated, &c 82

Page

16. Foods preserved in cans—Continued.
Canned in vinegar 85
Canned in oil 85
Canned dry, smoked, or dry-salted 85
Canned fish-extract 87

VI.—Marine Products Used for Clothing.

17. Furs 87
Mammal furs 87
Bird furs 89
18. Leathers 89
Prepared from mammal-skins 89
Prepared from reptile-skins 90
Prepared from fish-skins 96

VII.—Materials Employed in the Arts and Manufactures.

19. Ivory and bone 97
Ivory of mammals 97
Ivory of reptiles 98
Bone of mammals 98
20. Baleen 99
Whalebone in a crude state 99
Prepared whalebone 101
21. Plates and scales 102
Tortoise shell 102
Scales of fishes 102
22. Pearls and shells 103
Pearls and nacre 103
Cameo shells, &c 103
23. Fish glue and isinglass 103
Air bladders of fish 103
Ribbon isinglass 105
Indian glue 105
Glue from fish heads and bones 105
Glue from fish-skins 106
24. Sponges 114
American commercial sponges 114
25. Gelatine 114
Prepared from carrageen 114
26. Oils and fats 114
Mammal oils 114
Reptile oils 117
Mollusk oils 117
Fish oils 117
Menhaden oil and its products 117
Other fish oils 118
27. Perfumes 120
Mammal perfumes 120
28. Chemical products and agents employed in the arts and medicines 120
Derived from plants 120
Derived from fish 121
29. Fertilizers 121
Fish guanos 121

A.—INTRODUCTION.

TOTAL VALUE OF PRODUCTS.

The products of the fisheries of the United States in 1880 were valued at $43,046,053, and their value in 1882 was estimated to be 24 per cent. greater. This represents the first cost, or value to the fishermen, and if we estimate the products at the wholesale market prices the total amount would be about $100,000,000. The New England States stand first in importance in the value of the products, next in order come the Southern States bordering on the Atlantic, the Middle States next, then the Pacific coast, the Great Lakes, and last of all the States bordering on the Gulf of Mexico.

VALUE OF PRINCIPAL FISHERIES.

The relative importance of the products of the principal fisheries of the country in 1880 was as follows: General fisheries, $22,405,018; whale fishery, $2,323,943; fur-seal fishery, $2,289,813; menhaden fishery, $2,116,787; oyster fishery, $13,403,852; sponge fishery, $200,750; and marine salt industry, $305,890. An estimate by Mr. G. Brown Goode of the comparative value of the products of some of the fisheries included above under the head of the general fisheries, taken in the order of their importance, credits the cod fishery with $4,000,000; the Pacific salmon fishery, $3,300,000; mackerel fishery, $1,501,000; inland lake and creek fishery, $1,500,000; shad and alewife fisheries, $1,500,000; herring and sardine fishery, $1,130,000; clam and quahaug fishery, $1,014,000; Great Lake whitefish fishery, $900,000; lobster fishery, $732,000; Great Lake general fishery, $600,000; shore fishery of the Middle States, $600,000; weir and trap fishery of New England, $600,000; sea-otter fishery, $600,000; halibut fishery, $447,000; California shore fishery, $370,000; crab fishery, $328,000; winter haddock fishery, $295,000; sturgeon fisheries, $237,000; mullet fishery, $225,000; shrimp and prawn fishery, $209,000; eel fishery, $190,000; abalone fishery, $128,000; hake fishery, $90,000; South Atlantic shore fishery, $85,000; scallop fishery, $50,000; New England shore fishery, $50,000; red-snapper and grouper fishery, $48,000; smelt fishery, $48,000; turtle and terrapin fishery, $45,000; mussel fishery, $37,000; flounder fishery, $30,000; swordfish fishery, $28,000; Eastern salmon fishery, $22,000; seaweed industry, $19,000; and the Irish moss industry, $16,000.

IMPORTS AND EXPORTS.

The United States annually imports nearly $4,000,000 worth of fishery products, of which about one-fourth is brine-salted mackerel from the Dominion of Canada. The total imports for the ten years ended June 30, 1882, amounted to $33,861,793, and included 109,737,420 pounds of fresh fish, valued at $3,242,566, and 781,182 barrels of salt mackerel, at $5,513,779, received almost entirely from the Dominion of Canada free of duty under the treaty of Washington. For the year ended June 30, 1882, the imports of foreign fishery products amounted to $4,311,894, and included fresh fish, $488,925; brine-salted herring, 112,197 barrels, $641,414, received from Canada, Holland, and Germany; brine-salted mackerel, 58,443 barrels, $397,328, from Canada; sardines and anchovies in oil, $860,760, chiefly from France; $1,661,569 worth of other fish, chiefly from Canada; and 546,127 gallons of whale and fish oils, worth $261,898, chiefly from Canada and Newfoundland. Of the total imports $2,676,712 worth were admitted free of duty, and the balance, $1,635,182, paid duty.

The annual exports of domestic fishery products for the last ten years has averaged $4,877,062, exclusive of about $1,500,000 worth of fur-seal skins annually sent to Europe from Alaska, and about $100,000 worth of miscellaneous products not separately enumerated in the official reports. The domestic exports for the year ended June 30, 1882, amounted to $6,146,127, and included $89,148 worth of fresh fish sent to Canada and Cuba; dried or smoked fish, $635,155, chiefly to the West Indies; pickled fish, $244,454, chiefly to the West Indies; other cured fish, consisting largely of canned salmon, $3,218,581, more than two-thirds of which went to England; oysters, $612,793, more than one-half of which went to England; sperm oil, $551,212, over $500,000 worth of which went to Great Britain; whale and fish oils, $420,730, chiefly to Europe; whalebone, $325,333, chiefly to France and Germany; and spermaceti, $48,721, to England and Germany.

The proportion of exports to the various countries of the world in 1882 was as follows: Africa, $17,484; Argentine Republic, $15,019; Australasia, $340,437; Azores, Madeira, and Cape Verde Islands, $3,308; Belgium, $5,813; Brazil, $8,254; British Columbia, $16,671; British Guiana, $7,410; British Honduras, $12,460; Central American states, $14,826; Chili, $12,334; China and Hong Kong, $237,342; Denmark, $2,986; Dutch Guiana, $61,962; England, $3,054,126; France, $271,119; French Guiana, $31,029; Germany, $255,400; Gibraltar, $11,780; Hawaiian Islands, $96,941; Ireland, $15,000; Italy, $104; Japan, $5,823; Mexico, $31,744; Netherlands, $40,608; Newfoundland and Labrador, $256; Nova Scotia, New Brunswick, and Prince Edward Island, $35,993; Peru, $3,775; Quebec, Ontario, Manitoba, and Northwest Territory, $288,089; Russia, $194; Scotland, $322,953; Spain, $1,275; United States of Colombia, $47,408; Uruguay, $7,169; Venezuela, $14,457; British 'Vest Indies, $87,046; Danish West Indies,

$11,763; Dutch West Indies, $10,246; French West Indies, $25,076; Cuba, $201,072; Hayti, $440,612; Porto Rico, $3,585; San Domingo, $42,743; and other countries not enumerated, $32,435.

One of the special products the exportation of which has been constantly increasing in the last few years is oysters. The export of oysters in 1875 was only $170,277; in 1878 it was $393,061; 1879, $453,306; 1880, $543,895; 1881, $582,249; 1882, $612,793; 1883, $629,636.

THE CODFISH INDUSTRY.

The cod fishery is perhaps the most important of all the food-fish fisheries. The center of the industry is in New England, and the largest fishing port is Gloucester on Cape Ann. From this port and from Provincetown, on Cape Cod, and many other places along the coast, fleets of vessels are employed in fishing for cod and related species of the *Gadidæ*. The best fish, and, as a rule, from 25 to 30 per cent. of the total catch, are taken on George's Banks, about a hundred miles off the Massachusetts coast. The Grand Banks of Newfoundland, the Western Banks, and numerous fishing grounds near the New England coast, also furnish large quantities.

The haddock (*Melanogrammus æglefinus*) is sold in great numbers as a fresh fish; 21,226,371 pounds being sold fresh in Boston and Gloucester wholesale markets in 1880. Codfish to the number of 23,796,570 pounds were sold fresh in Massachusetts markets in 1880, but a much larger quantity, 148,327,885 pounds, were prepared as dry-salted cod, producing 56,064,757 pounds dried.

The total quantity of cod, haddock, and other *Gadidæ* taken by New England fishermen in 1880 was 352,280,670 pounds fresh weight; of this amount 230,810,877 pounds were cod (*Gadus morrhua*), 37,553,965 pounds haddock (*Melanogrammus æglefinus*), 32,460,479 pounds hake (*Phycis chuss* and *P. tenuis*), and 48,460,555 pounds were pollock (*Pollachius carbonarius*), cusk (*Brosmius brosme*), and minor species. More than three-fourths of the total catch of *Gadidæ* above given, or 265,210,123 pounds, was cured by dry-salting, producing about 101,116,098 pounds of cured fish. The weight of a large part of the cured product was further reduced before sale by stripping the fish of skins and bones and packing as boneless-fish.

There are two principal methods of preparing dry-salted fish, one the pickle-cured and the other the dry-cured. All fish for exportation, unless prepared as boneless, are dry-cured, while for home consumption, even though they are sent to remote parts of the country, they are pickle-cured. By the first method, the cod, after being split and cleaned, are allowed to remain in brine until they take up much salt, and are then quickly and slightly dried, sometimes only a few hours being allowed for the drying. A large proportion of the dry-salted fish is thus prepared, much of it being cut up as boneless, and it is found to keep well, except in the warmest weather. By the dry-cured method the

fish, after being split and salted, are kenched, and afterwards washed, drained, and dried until most of the moisture is removed.

THE MACKEREL INDUSTRY.

The mackerel industry is a New England enterprise, and most of the vessels of the mackerel fleet are owned in Massachusetts. The total catch of mackerel by United States fishermen in 1880 was 131,939,222 pounds, of which amount 117,500,000 pounds, equal to 343,808 barrels, were brine-salted, and the rest sold fresh or put up in cans. In 1881 the catch was even larger, reaching about 150,000,000 pounds. The production of the American fleet, although so large, is not sufficient to supply the home trade, and an additional quantity, amounting in 1880 to 112,468 barrels, or about 33,750,000 pounds fresh weight, was imported almost entirely from the Dominion of Canada. In 1881 the imports were 120,297 barrels, valued at $614,826. In 1882 the imports were only 58,443 barrels, this small amount resulting from a scarcity of fish in Provincial waters. A small amount of pickled mackerel, ranging from a few hundred to three or four thousand barrels, is annually exported from the United States to the West Indies, and consists chiefly of low grades of fish received from Canada.

As seen above, most of the mackerel catch is brine-salted in barrels, a comparatively small amount being consumed in a fresh condition. There has grown up, however, within a few years, a rapidly increasing demand for canned fresh mackerel. These are put up either plain-boiled or broiled and seasoned with tomato or mustard sauce. The former method is the ordinary process of canning fresh fish. On reaching the cannery the fish are cleaned, the heads and tails removed, and are washed in strong brine, to give them a salty flavor. They are then sealed in cans and immersed in boiling water until thoroughly cooked. After being vented and cooled, the cans are painted, labeled, and packed in wooden cases. The principal sizes of cans are those holding 1 pound, cylindrical in form, and measuring 4½ inches in height by 3 inches in diameter, and 2-pound cans, of the same height, but an inch larger in diameter. There is a loss of about one-quarter in weight by dressing.

The second method of canning, by broiling, is practiced in two ways. By the first way the fish are treated the same as sardines. They are washed, dried, fried in oil, and put up in tins with vinegar and spices. By the second way, and the one in more general use, the fish are cleaned, the heads and tails removed, and then put for a few minutes in strong brine. They are then again washed, spread on wire trays, and steamed for several minutes in a tight box. The fish, still on the trays, are next put into an oven to be baked or broiled, and are then packed in tin boxes of oval shape, holding about 3 pounds each. A sauce of mustard or tomato, seasoned with spices, is added for flavoring. The next step is to seal the cans and subject them to a hot-water bath, after

which they are vented, cooled, and labeled "fresh-broiled mackerel." Most of the fresh mackerel canned are of small size, too small for barreling, and which were formerly thrown away.

Brine-salted or pickled mackerel are generally packed in barrels holding 200 pounds of fish. In Maine and Massachusetts the barrels are by law required to be of certain kinds of wood and properly made, and the fish must be sorted into designated sizes and the packed barrels inspected and branded by a State officer. The legal sizes of mackerel in Massachusetts are numbers one, two, three, three large, and four. The first grade are mackerel of the best quality, not mutilated, free from rust, taint, or damage, and measuring not less than 13 inches from the extremity of the head to the crotch or fork of the tail. The second grade are the next best quality, free from rust, taint, or damage, and measuring not less than 11 inches in length. Those that remain after the above selections, if free from taint or damage and measuring not less than 13 inches in length, are number three large. The next inferior quality, free from taint or damage and not less than 10 inches in length, are number three, and all other mackerel free from taint or damage are called number four.

For convenience of sale much of the brine-salted mackerel are put up in half, quarter, eighth, and sixteenth barrels. Since the year 1879 a demand has sprung up for still smaller packages, and many are now packed in 5-pound, or even 3-pound, tin cans. Fish thus put up are chiefly number two mess mackerel, or those deprived of heads and tails. The process of canning is very simple, and requires no heat except for soldering. The fish are washed and scraped, to give them a neat appearance, and sometimes, if large, they are cut in pieces. The proper weight of fish is then put in the can, the cover soldered on, and through a small hole left in the side or cover enough strong brine is poured in to fill the can. The hole is then sealed up, and the cans, after being painted to prevent rusting, and neatly labeled, are packed in wooden cases.

THE MENHADEN INDUSTRY.

The menhaden (*Brevoortia tyrannus*), called also mossbunker, pogy, and by other names, is the most important fish on the American coast for the manufacture of oil and guano. It is also of value as bait for cod and mackerel. Large quantities were used for mackerel bait in former years, before the general introduction of the purse-seine in that fishery. As a food-fish the menhaden is not valuable, though considerable numbers are eaten at a few places. An effort was made a few years ago to introduce menhaden canned in oil, under the names of "American sardines," American boneless sardines," and "shadines," but as the herring has proved a much better "sardine" this industry does not appear to have prospered. An extract of fish made from the juices of the flesh of menhaden was patented several years ago, but has not become popular. The menhaden abounds from Maine to North Carolina. Factories

for the manufacture of this fish into oil and guano are located all along the coast within those limits, though the largest factories are along the Rhode Island, Connecticut, and New York shores. Twenty-five years ago only a few millions of these fish were annually taken, but in 1878 the quantity captured reached the enormous number of 777,000,000. In 1880 the number taken was 570,424,377 fish, from which were produced 2,066,396 gallons of oil, worth $733,424; 68,904 tons of guano, worth $1,301,217; and $61,669 worth of compost. The oil is used in currying leather, in rope-making, for lubricating, for adulterating linseed oil, as a paint oil, and is also largely exported to Europe for use in the manufacture of soap and for smearing sheep.

To illustrate the preparation of menhaden oil, a large model of a factory is exhibited, showing the cooking-tanks, the presses, oil-room, and the entire apparatus incident to the business.

THE SMOKED-FISH INDUSTRY.

In smoked fish the principal kinds are herring, haddock, and halibut, though sturgeon, salmon, smelts, and other species are frequently prepared by smoking. The smoked-herring business is carried on chiefly in Maine, where in 1880 the quantity of fresh herring thus prepared was 6,138,942 pounds, producing 370,615 boxes of smoked fish, worth $99,973. Haddock smoked as "Finnan haddies" were prepared in Maine in 1880 to the amount of 1,414,500 pounds cured fish worth $78,175. Smoked halibut are prepared only in Massachusetts, where in 1880 5,094,700 pounds of fresh fish yielded 1,273,675 pounds of the cured article, worth $101,894. In the fisheries of the Great Lakes nearly 2,000,000 pounds of smoked whitefish, sturgeon, and other fish are annually prepared, and on the Pacific coast some 200,000 pounds of salmon.

THE SALMON INDUSTRY.

The salmon fishery is carried on almost exclusively on the Pacific coast. In 1880 there were forty-five canneries in operation, which put up 655,274 cases, or 31,453,152 one-pound cans of salmon, worth $3,255,365. The number of fish consumed by the canneries was 2,152,509, and their weight, fresh from the water, 43 379,542 pounds. About 2,000,000 pounds of salmon were consumed fresh in San Francisco; 200,000 pounds were smoked and 1,585,500 pounds salted in barrels. The total catch was 2,755,000 fish, weighing 51,862,000 pounds. The great abundance of salmon in the rivers of Alaska has led to the establishment of canneries in that Territory. The largest salmon on record as put up in a can is shown in the exhibit of the Cutting Packing Company. It was taken at the mouth of the Kusiloff River, Alaska, July 22, 1882, and weighed when fresh 86 pounds, and canned 65 pounds. Further details of the salmon industry of Alaska, as also information about the abundance of other fishes in that Territory, are given by Dr. Tarleton H.

Bean, in Section F, "Catalogue of the Collection of Fishes." In the year 1882 there were from thirty-five to forty canneries in operation on the Columbia River, ten on the Sacramento River, one each on the Eel and Rogue Rivers, and four on the Umpqua River.

The quantity canned in 1882 in United States canneries on the Pacific coast was about 1,000,000 cases, or 48,000,000 one-pound cans, equivalent to about 60,000,000 pounds of live fish. Of this enormous amount of fish one-half goes to Great Britain, where much is re-exported; the United States consumes about 300,000 cases; about 100,000 cases go to Australia; the balance to other countries.

In the ordinary method of canning salmon the fish are beheaded, cleaned, and cut into pieces of suitable size to fill the cans within one-fourth of an inch of the top. The covers are then put on and soldered down. The air-tight filled cans are next passed to the boilers or vats, measuring about 5 feet long, 4 feet wide, and 4 feet deep, when they are steamed for an hour, then taken out and cooled. A small hole in the lid, hitherto soldered up, is now opened by applying a hot iron, the gases allowed to escape and the cans immediately made air-tight again. They are next boiled for two hours in a bath of water salted to raise the boiling point, and after cooling are labeled and packed in cases of four-dozen one-pound cans each.

THE SARDINE INDUSTRY.

The sardine industry is confined to the State of Maine. It is of recent origin, and until 1880 was carried on chiefly at Eastport. Experiments in this business were made as early as 1866, but it was not fairly inaugurated until 1875, since which time it has rapidly increased. According to the Tenth Census it gave employment in 1880 to 1,876 fishermen and factory hands. The production of the canneries in that year was 7,550,868 cans, valued at $788,576. The fish were the common sea herring (*Clupea harengus*), the small ones being classed as sardines, and the large ones either as herring or sea trout. The sardines were canned in oil, spices, mustard, in tomato sauce, or put up in barrels and kegs as Russian sardines and anchovies. The quantity of each brand was as follows: Sardines in oil, 6,141,400 one-quarter pound and 142,000 one-half pound cans, worth $571,303; sardines in spices, 579,850 one-half pound cans, $86,978; sardines in mustard, 538,650 one-half pound cans, $80,797; sardines in tomato sauce, 22,700 one-half pound cans, $4,540; brook trout, or large herring, 24,000 two-pound cans, $6,500; sea trout, or large herring, 50,584 three-pound cans, $22,058; "broiled mackerel," 50,784 three-pound cans, $16,400; Russian sardines, 8,165 barrels, $28,578; and anchovies, 200 barrels, $500.

While the canning of small herring as sardines is carried on only in Maine, the larger herring are also put up in Boston, Gloucester, and other places. The import of foreign sardines and anchovies might perhaps be supposed to decrease in proportion to the increase of the quan-

tity canned in this country, but so rapidly is the general trade in fish increasing that the imports are even greater than before. In 1875 the value of sardines and anchovies imported was $526,179; in 1878, $677,910; 1880, $1,102,410; 1881, $987,394; 1882, $860,760; and, 1883, $911,668.

THE SHAD AND ALEWIFE FISHERIES.

The fisheries for shad (*Clupea sapidissima*) and for alewives (*Clupea vernalis* and *C. æstivalis*) yield annually nearly 20,000,000 pounds of the former and 40,000,000 pounds of the latter fish. Shad are taken chiefly in the rivers of Connecticut, New York, Delaware, Maryland, Virginia, and North Carolina. In 1880 the total catch of all the States on the Atlantic seaboard was 18,068,116 pounds, valued at $1,004,462. They are eaten either fresh, salted, or smoked, though by far the greater part are marketed fresh. One-third the entire catch of alewives comes from the sounds and rivers of North Carolina. In 1880 the yield of that region was 15,520,000 pounds as compared with 43,194,651 pounds for the whole Atlantic seaboard. The Maryland alewife fisheries yielded 9,128,959 pounds, and those of Virginia 6,925,413 pounds, while Maine and Massachusetts rivers yielded each over 3,000,000 pounds. Alewives are very largely brine-salted in barrels. A large photograph in the exhibit represents a number of negro women cleaning and packing alewives at a fishery in North Carolina.

STURGEON AND CAVIARE.

Sturgeon (*Acipenser* sp.) are found in many of the rivers, but they are not sought for to any extent east of New York. The take of that fish in New York in 1880 was 144,000 pounds; in New Jersey 300,000 pounds; Pennsylvania, 150,000 pounds; Delaware, 570,000 pounds; Maryland, 144,000 pounds; Virginia, 411,000 pounds; North Carolina, 436,900 pounds; and other Southern States, 618,250 pounds. In North Carolina and Georgia 80,250 pounds of sturgeon roe were salted down as caviare. Sturgeon roe is prepared and put up in cans under the trade names "American caviare" and "Russian caviare" and has a large sale. A considerable quantity of sturgeon is canned and branded "Albany beef," a name said to be given to it from the fact that it was first brought into the market at the city of Albany, on the Hudson River, New York.

The sturgeon fisheries of the Great Lakes, especially Lakes Michigan, Huron, and Erie, are extensive, the quantity of that fish taken in 1880 amounting to 7,012,100 pounds. Of this amount 5,050,700 pounds were sold fresh, 1,258,180 pounds were smoked, and there were prepared 230,160 pounds of caviare, 3,909 pounds of isinglass, and 5,680 gallons of oil. The other fish taken in the Great Lakes in 1880 were 21,463,900 pounds of whitefish (*Coregonus* sp.), 6,804,600 pounds of trout, 15,356,300 pounds of herring, and 18,105,100 pounds of pike, bass, muskallonge, catfish, and numerous other species.

COMMERCIAL FISHERIES OF THE MIDDLE STATES.

The products of the commercial fisheries of the Middle States include a great many kinds of fish, most of which are consumed fresh. In 1880 the total weight of all the fish taken in these States, which embrace New York, New Jersey, Pennsylvania, and Delaware, was 413,525,862 pounds, and included 318,588,700 pounds of menhaden, 23,228,100 pounds of shelled oysters, 11,063,500 pounds of squeteague (*Cynoscion regalis*), 6,710,800 pounds of bluefish (*Pomatomus saltatrix*), and many other species of fish and miscellaneous products. Of the whole product more than 70 per cent. was consumed as fertilizers, about 12 per cent. was fish sold fresh for food, and about 2,500,000 pounds of fish were salted; the balance included 41,508 pounds of terrapin, over 9,000,000 pounds of crabs, and about 10,000,000 pounds of shelled clams.

THE COMMERCIAL FISHERIES OF THE SOUTHERN STATES.

The rivers, bays, and adjacent ocean waters of the Southern States on the Atlantic seaboard abound in excellent food-fish, but the fisheries are but partially developed. In 1880 there were 297,539,167 pounds of fishery products taken in these States, which embrace Maryland, Virginia, North and South Carolina, Georgia, and Eastern Florida. Referring to Bulletin No. 298, Tenth Census, we find that fully two-fifths, or 124,231,240 pounds, of the entire product are oyster meats, an allowance of seven pounds being made for each bushel of oysters in the shell. Of the remainder, 92,194,800 pounds are menhaden (used for oil and guano), 32,184,372 pounds are alewives, and 10,878,942 pounds are shad. These are the only species taken in quantities exceeding 5,000,000 pounds. Five kinds, the mullet, crab, bluefish, perch, and striped bass, are taken in quantities exceeding 2,000,000 pounds, while the catch of nine others ranges between 1,000,000 and 2,000,000 pounds.

THE OYSTER INDUSTRY.

The oyster industry in 1880 yielded 22,195,370 bushels, worth to the producers $9,034,861, which value was increased by replanting or by packing in tin cans so that the marketable value was $13,403,852. The proportion produced by the different States was as follows: For New Hampshire, 1,000 bushels; Massachusetts, 36,000 bushels; Rhode Island, 163,200 bushels; Connecticut, 336,450 bushels; New York, 1,043,300 bushels; New Jersey, 1,975,000 bushels; Delaware, 300,000 bushels; Maryland, 10,600,000 bushels; Virginia, 6,837,320 bushels; North Carolina, 170,000 bushels; South Carolina, 50,000 bushels; Georgia, 70,000 bushels; Florida, 78,600 bushels; Alabama, 104,500 bushels; Mississippi, 25,000 bushels; Louisiana, 295,000 bushels; Texas, 95,000 bushels; Washington Territory, 15,000 bushels.

Oysters are marketed either in the shell, shucked, or steamed and canned under the trade name of "Cove oysters." The methods of pre-

paring and packing oysters are fully described in Section D of this Bulletin, and need not be repeated here.

THE CLAM INDUSTRY.

The clam industry is of great importance, especially in the New England States. Two species are chiefly taken, the long clam (*Mya arenaria*), abundant north of Cape Cod, and the quahaug, or round clam (*Venus mercenaria*), south of Cape Cod. The former is extensively used both as food and as bait in the cod-fisheries. Another species, the sea-clam (*Mactra solidissima*), is of importance in the Cape Cod region, being used as the other kinds for food or bait. In 1880 the total number of long clams taken in the United States was 164,195,200, equivalent to 835,974 bushels, and valued at $330,523. Of the quahaug, or round clam, 326,245,800 were taken, equivalent to 1,087,486 bushels, worth $657,747. Quite an extensive industry in canning clams is carried on in Maine, where in 1880 the quantity thus put up was 518,476 pounds of clam meat, equal to 51,847 bushels of clams in the shell, and valued at $47,318. Other species of mollusca are classed as fishery products, and are discussed in the section devoted to Economic Mollusca.

THE LOBSTER INDUSTRY.

The lobster fishery is chiefly a New England industry. The total weight taken in 1880 was 20,128,000 pounds, worth $732,000. Lobsters are marketed either whole or canned. In New England towns fresh-boiled lobsters are sold in the fish markets and peddled in the streets. The canning of lobsters in 1880 was confined to the coast of Maine, where there were 23 canneries open from April 1 to August 1. The quantity of live lobsters used by these canneries was 9,494,284 pounds. The number of one-pound cans put up was 1,542,696, of two-pound cans, 148,704, and of other brands 139,801 cans, having a total value of $238,280. Seventeen canneries, located in Newfoundland, Nova Scotia, and other British provinces, were owned by Americans. The product of these canneries in 1880 was valued at $246,000, and was all exported to Europe and other foreign countries without passing through the United States. Further details of this industry, as also of the business in shrimps, prawns, and other crustaceans are given by Mr. Rathbun in the section devoted to Economic Crustaceans, Worms, &c. In the same section the particulars of the American sponge industry are also given.

THE WHALE FISHERY.

In Section E, "The Whale Fishery and its Appliances," will be found a statistical statement of the products of that fishery. The industry is of small importance compared with thirty or forty years ago, and is now carried on in but few places. New Bedford and Provincetown in Massachusetts, and San Francisco on the Pacific coast, send out fleets

that annually bring home a large amount of oil and bone. Refineries for the preparation of the oil and the manufacture of candles are located at New Bedford and are about to be started at San Francisco.

Little use is made of crude sperm oil, though half the production of other kinds of whale oil is used in a crude state by cordage manufacturers. Sperm oil is refined by steaming, chilling, and pressing, and is sent into the markets as "spring make natural," "spring make bleached," "natural winter," "bleached winter," and "double bleached." One of the products of pressing the chilled oil is crude spermaceti, which is refined and either made into candles or used in the arts and medicine. Common whale oil refining yields, besides several grades of oil, a proportion of whale "foots," used by soap-makers and tanners, and whale soap, used largely for scouring woolens.

Ambergris is a product of the whale fishery, being found in the intestines of the sperm whale. As only sickly whales yield this article, it has been considered a product of disease. When of good quality, it is worth its weight in gold. It is used in the manufacture of fine perfumes, having the property of closely and permanently uniting the ingredients. A common practice among sperm whalers is first to strip the blubber from the animal, then to open its bowels from the orifice of the anus and search for ambergris. It may be found in any part of the intestinal canal, but is more generally found within 6 feet of the vent. Some large pieces are occasionally secured. One of the most valuable finds of the last forty years was a lump weighing 136 pounds, taken by the crew of the bark Adeline Gibbs, of New Bedford, in 1878. "It was in one lump, except a piece of about three pounds. In shape it was oval; the middle part was the diameter of a flour barrel, and in length four inches short of the length of the barrel. The whole weighed, by the ship's scales, 142 pounds. When sold it weighed 136 pounds, and brought $23,000."

THE FISH-OIL INDUSTRY.

Cod-liver oil for medicinal and tanners' use is made chiefly in New England. Most of it is steam-refined, and the best medicinal oil is also cold pressed, being subjected to a low temperature in a refrigerator and then put in bags and submitted to powerful pressure to more thoroughly separate the foots or stearine.

Menhaden oil has been discussed under the menhaden industry. There is shown in the exhibit oils from many kinds of fish; most of them are used in the preparation of leathers. The oil of the candle-fish or oulachon, of the Pacific coast, is used by the Indians both for food and illumination. The oil of sun-fish is considered by some a good cure for rheumatism.

THE FUR INDUSTRY.

Fur-seal skins to the number of 150,000 to 170,000 are annually produced by the seal fisheries controlled by the United States. The greater

number are taken on the Pribylov Islands, in Alaska, and on the Commander Islands, leased from the Russian Government by the Alaska Commercial Company. Some fur seals are captured in the vicinity of Cape Flattery, at the entrance to Puget Sound, and others farther south along the California coast. Another fur-seal fishery is worked by Americans in the vicinity of Cape Horn, South America, and yields annually from 7,000 to 10,000 skins. Nearly all the seal skins are sent to Europe to be plucked and dyed, and many of them afterwards returned to be manufactured into cloaks, capes, hats, and other wearing apparel. At Albany, in the State of New York, there has been for many years a factory for dyeing these skins, but the number annually dyed is not large.

In 1880 some 6,000 skins of the sea-otter, worth $600,000, were taken in Alaska. Other fur-bearing animals are captured in various parts of the United States. The common otter (*Lutra canadensis*) is found in the Lake Superior region, in many of the Western States, and in Florida, though the skins of Florida otter are but half the value of those from Lake Superior. The beaver (*Castor canadensis*) is taken in Utah, the Lake Superior region, and other places. Some excellent white and light-colored beaver skins from Alaska are shown in the exhibit. The musquash (*Fiber zibethicus*), mink (*Putorius vison*), and the fisher or pekan (*Mustela Pennanti*), are also taken for their fur.

In bird furs there is shown a cape or robe made by the Makah Indians of Washington Territory from the down of the loon (*Colymbus torquatus*), and a robe from California, made from the skins of the brown pelican (*Pelecanus fuscus*).

LEATHERS, IVORY, AND BONE.

The exhibit of leathers prepared from the skins of aquatic animals includes rough hides and manufactured articles from the sea-lion (*Eumetopias Stelleri*), from the banded seal (*Histriophoca fasciata*), and other species of seals, harpoon-lines from hide of walrus and seal, a large collection of objects made from the skin of the Florida alligator (*Alligator mississippiensis*), and some articles from skins of salmon, cusk, and other fishes.

In ivory and bone there are shown walrus and narwhal tusks, teeth of sperm whale, and alligator teeth, both in the crude and the manufactured conditions. Baleen, commonly called whalebone, is exhibited in all its varieties, both in rough slabs and prepared for use in numerous trades. Tortoise-shell, fish-scales, pearls, cameo, and other shells are shown in several varieties.

FISH GLUE AND GUANO.

An industry of recent origin and one which is rapidly growing is the preparation of glue from the skins of cusk, cod, and other fishes. It is confined to Cape Ann, in Massachusetts, where there are three fac-

tories in active operation. The material used in making the glue is the waste of the boneless-fish factories, which, until within eight or ten years, was thrown away as useless. The glue is found to be adapted to many uses, and is considered preferable to cattle glue in many trades. An excellent quality of guano is made from the cooked skins after the glue has been extracted. From fish-oil refuse there is also made a good guano. The best fish guano is made from the menhaden; several qualities of this guano, as also the apparatus used in its manufacture, are shown in the exhibit.

B.—METHODS OF PREPARATION.

I.—PREPARATION AND PRESERVATION OF MARINE PRODUCTS FOR FOOD.

1. Preservation during life.

fish cars and floating cages.

Live-fish car.

Full size; made of wood; boat-shape; sharp at both ends; flat bottom; holes in sides and bottom; top covered with hinged lid. Length 5 feet on top, 37 inches on bottom. Width on top, amidships, 22 inches. Depth, 14 inches. New Bedford, Mass., 1882. Gift of James Beetle. Towed astern of boats by fishermen of Southern New England, for the preservation of live tautog and bluefish.

Floating fish car.

Model, scale $1\frac{1}{4}$ inches to foot. A series of six wooden crates suspended in frame with floats on two sides. Length, 10 inches; width, 9 inches; depth, 3 inches. Newport, R. I., 1877. 29,538. Gift of J. M. K. Southwick. Used for preserving live fish at market.

Fish marketman's car.

Model. Rectangular shape; sides and bottom made of slats; top, of boards, with openings. Length, $6\frac{1}{4}$ inches; width, $4\frac{1}{4}$ inches; depth, $2\frac{3}{4}$ inches. Newport, R. I., 1877. 29,539. Gift of J. M. K. Southwick. Used by the fishermen of Southern New England for the preservation of live fish and lobsters.

Noank lobster car.

Model, scale, $1\frac{1}{4}$ inches to foot. A crate made of slats of wood; in two compartments; top flat, bottom bulging. Length, $18\frac{1}{2}$ inches; width, $9\frac{1}{2}$ inches; depth, 6 inches. Noank, Conn., 1878. 29,297. Gift of Capt. H. C. Chester. Used at the fish wharves for the preservation of live lobsters and fish.

Live-car.

Model. A boat-shaped wooden box; sharp at each end. Made of slats set a short distance apart. Used by vessels to keep fish alive for market. Providence, R. I. 22,221. D. D. Almy.

PHOTOGRAPHS OF LIVE-CARS.

View in rear of Fulton Fish Market, showing floating open-work wooden cages for preserving live fish for marketing. New York. Photos. 2119–'20. U. S. Fish Commission.

2. PRESERVATION OF FRESH MEATS.

REFRIGERATION.

CHASE'S COLD-BLAST REFRIGERATOR (full size).

"This scientific system of refrigerating with ice, or ice and salt, or other freezing mixture, is the invention of Andrew J. Chase, of Boston, Mass. It has been in use now five years. The strong points of this system are claimed to lie in the fact that it is adapted to all purposes, as it gives any temperature from 24° below freezing to 42° above zero. The internal circulation of the air is very brisk and dry, a necessary condition for preserving perishable goods. Thus far this refrigerator has been used principally for heavy work, or upon a large scale. At this time there are about 2,000 cold-blast cars in use, transporting dressed beef from the West to all the principal cities and towns from Maine to New Orleans and Florida. Thirty-two large English steamships have been fitted for transporting fresh meats to Europe. These have a capacity ranging from 800 to 1,800 quarters of beef each. The leading hotels and markets of the States are also fitted with these important structures. Cold-blast preserving houses are getting very popular in all parts of the country. Boston has the largest one in the world, just finished. Fish-dealers are beginning to see that the old slop and slime method of packing in ice must very soon give place to the dry handling." Exhibited by A. J. Chase.

CHASE'S MONITOR DISPLAY REFRIGERATOR.

"This refrigerator is used by those who wish to display small goods, such as print butter, chops, steaks, and fish. It is very economical in the use of ice, costing but a few cents to run it during the day. It is made in three sizes at present prices, $15, $20, and $25. These may be used with ice and ice-water, or with salt and ice, according to the temperature required." Exhibited by A. J. Chase, Boston, Mass.

MODEL OF REFRIGERATOR.

Philadelphia, Pa. Ridgway Refrigerator Company (limited).

REFRIGERATOR OYSTER CAN.

Sheet-metal refrigerating can for oysters in bulk; flanged ends; wooden covers or guards. Capacity, 15 gallons. Baltimore, Md. A. Booth. "A sheet-metal can with flanged edges pro-

REFRIGERATOR OYSTER CAN—Continued.

jecting from the ends of the can. In the center of the can, extending from top to bottom, is formed a rectangular ice-chamber, which is opened at the top and has four sides exposed within the body and to the contents of the can. The can proper is filled with oysters through an opening in the top, which is securely closed by means of a screw. The ice-chamber is closed by means of a wooden cover, of suitable dimensions to fit snugly within the flanged edges of the end of the can over the opening into the ice-chamber and upon and against the screw-cap and projecting a little beyond the ends of the flanges, and secured thereto so as to be easily removed. At the other or opposite end of the can is also firmly and securely fastened a similar wooden cover or guard. Those covers or guards also serve the purpose to protect the ends of the can from injury during transportation. After the can is filled with oysters, the ice-chamber with ice, and the covers securely fastened, the sides of the can are enveloped with a woolen covering to absorb moisture and to assist in producing evaporation, thereby more effectually excluding heat from the contents of the can."

LOW'S PATENT ICE-CRUSHER.

Adapted for hand, steam, or water power. Adjustable cylinders move the cutting-knives so that ice may be crushed to any desired degree of fineness. Used at Gloucester and other fishing ports where fish are packed fresh for transportation inland. "It may not break up ice as rapidly as some other crushers, but no other machine has so complete command of its feed, enabling one machine to do the work for packing all kinds of fish. Adding more than two cylinders to a machine requires heavier balance-wheel and more power to run it. It is more likely to get broken, and cannot be so durable as the simpler form, fed with ice picked to the required size to feed readily and shoveled into the hopper, when one man turning can break it up as fast as another can shovel it in." Exhibited by Colonel David W. Low. Gloucester, Mass.

DEVIL'S CLAW.

Iron; claw with semicircular shank hinged to bar which has step at end. Length, $2\frac{1}{2}$ feet. Gloucester, Mass., 1878. 32,695. U. S. Fish Commission. Used by fish packers to press down the covers of fish boxes during the process of nailing.

ICE-MALLET (large).

The head is a cylindrical block of lignum-vitæ, sawed off square at the ends, and slightly flattened at the side next the handle, which is of hard wood. Length of head $6\frac{1}{2}$ inches,

ICE MALLET (large)—Continued.

diameter 6 inches; handle, 25 inches long, 1½ inches thick. Gloucester, Mass., 1880. 39,191. U. S. Fish Commission. Used in vessel's hold for crushing ice for packing fresh fish.

ICE-CUTTER.

A flat chisel-shaped piece of steel, with saw-like teeth on the lower edge. Hard-wood handle, with iron ferrule on lower end; length of handle, 3⅓ feet; blade, 5 inches; width of blade, 5 inches. Gloucester, Mass., 1876. 32,686. Gift of J. A. Voss. Used for chopping up ice for the purpose of packing fresh fish.

ICE-HOOKS.

Iron; steel-pointed; two semicircular sharp-pointed hooks of flat iron, with oval-shaped handle at top. These hooks are riveted together near the top. Gloucester, Mass., 1883. 32,674. U. S. Fish Commission. Used for lifting ice by hand or for hoisting it. In the latter case the tackle is hooked into one of the loop-shaped handles of the hooks.

ICE-PICK.

A sharp-pointed steel prong, with socket, riveted to wooden handle. Length, 4¼ feet. Gloucester, Mass., 1880. 56,892. Gift of David W. Low. Used in handling cakes of ice for packing fresh fish, &c.

OYSTER CANS.

Quart tin cans for transportation of raw oysters to the interior of the country. In these cans raw oysters are placed, and the covers having been soldered on, they are packed in boxes of ice. R. H. Edmunds, Baltimore, Md. 39,313.

OYSTER-PACKING.

[For list of appliances for opening and packing fresh oysters, see Section D, "Catalogue of Economic Mollusca."]

SERIES OF PHOTOGRAPHS, 30 BY 40 INCHES AND 8 BY 10 INCHES, ILLUSTRATING THE FRESH-FISH INDUSTRY.

ICE-GRINDER.

Machine for grinding ice for packing fresh fish. Sandusky, Ohio, 1882. Photo. 2197. U. S. Fish Commission.

FROZEN FISH.

Pans of frozen whitefish (*Coregonus* sp.) from refrigerator. Detroit, Mich., 1882. Photos. 2203, 2203*a*. U. S. Fish Commission.

FISH-PACKING HOUSE.

Interior of Josepell & Co.'s fish-packing house. Detroit, Mich., 1882 Photos. 2207–8. U. S. Fish Commission.

FISH-PACKING HOUSE.

Interior of Davis's fish-packing house. Detroit, Mich., 1882. Photo. 2206. U. S. Fish Commission.

UNLOADING FRESH FISH.

Deck of haddock vessel, schooner Belle A. Keys, of Boston, unloading haddock at Commercial wharf. Boston, Mass., 1882. Photo. 1804. U. S. Fish Commission.

CLEANING FISH.

View of deck of fish-market boat at Commercial wharf. Crew cleaning fresh cunners (*Tautogolabrus adspersus*). Boston, Mass., 1882. Photo. 1802. U. S. Fish Commission.

WEIGHING AND DRESSING COD.

View at Cape Ann Fish Company's wharf, with men weighing and dressing fresh cod. Gloucester, Mass., 1882. Photo. 1953. U. S. Fish Commission.

ICING FRESH COD.

View at Cape Ann Fish Company's wharf, with men packing in ice and weighing boxes of fresh cod. Gloucester, Mass., 1882. Photo. 1954. U. S. Fish Commission.

DRESSING HALIBUT.

Men dressing fresh halibut on deck of schooner Willie M. Stevens, preparatory to icing in the vessel's hold. Gloucester, Mass., 1882. Photo. 1974. U. S. Fish Commission.

FRESH HALIBUT INDUSTRY.

Landing fresh halibut from schooner Willie M. Stevens, of Gloucester, at Stockbridge & Co.'s wharf. Gloucester, Mass., 1882. Photo. 1973. U. S. Fish Commission.

FRESH HALIBUT INDUSTRY.

Weighing and packing fresh halibut in ice at Stockbridge & Co.'s wharf. Gloucester, Mass., 1882. Photo. 1972. U. S. Fish Commission.

ICE INDUSTRY.

View of ice-houses of Fernwood Lake Ice Company, showing lake in foreground and machinery for hoisting in ice. West Gloucester, Mass., 1882. Photo. 1957. Front view of same building, showing wagons loading and loaded. Photo. 1956. United

ICE INDUSTRY—Continued.

States Fish Commission. This building is 213 feet wide, 230 feet long, 34 feet high in stud, and 72 feet high to ridge pole. Its capacity is 34,000 tons of ice. Built in 1876–'77. Nine-tenths of the ice is used in the fisheries of Gloucester either by vessels or in packing fish on shore. Another ice company in Gloucester shares in furnishing the supply, which amounts annually to about 25,000 tons.

ICE-WAGON.

Unloading ice from wagon for vessel at Commercial Wharf. Boston, Mass., 1882. Photo. 1808. U. S. Fish Commission. Vessels that preserve their catch fresh take from 5 to 45 tons of ice on a trip; the quantity depending on the size of the vessel and length of the trip.

3. PRESERVATION BY DRYING.

APPLIANCES FOR PREPARING AND PACKING SUN-DRIED FISH.

CODFISH-FLAKE.

Model. Old-style brush flake used on Cape Cod for drying fish; consists of a wooden frame or long table of slats covered with brush-wood. Provincetown, Mass. 39,433. Collected by Capt. N. E. Atwood.

CODFISH-FLAKE.

Model. New style flake; consists of a wooden frame or long table of slats, the top being movable on a horizontal axis, thus making it possible to expose the fish placed upon it to the direct rays of the sun during the whole day, or to keep them in the shade, as may be most desirable. Provincetown, Mass. 39,434. Collected by Capt. N. E. Atwood.

FISH HAND-BARROW.

Oak; two handles 6 feet long, with five cross-bars, each 21 inches long, 2½ inches wide, 1½ inches thick. Gloucester, Mass., 1883. 57,828. U. S. Fish Commission. Used for carrying fish.

BOX-NAILING TABLE.

Full size, heavy wooden table, with appliances for holding the covers in place while being nailed on tops of boxes. Used in boneless-fish factories, and especially adapted for 40-pound boxes. Gloucester, Mass. U. S. Fish Commission.

BONELESS-FISH COMPRESSOR.

A patent hoe-shaped instrument with lever. Used for crowding boneless-fish into the boxes. Gloucester, Mass. U. S. Fish Commission.

CUTTING-BOARD FOR BONELESS FISH.

Pine wood; 3 feet long, 25½ inches wide, 1¾ inches thick. New. Gloucester, Mass., 1883. 25,855. U. S. Fish Commission. Used in making boneless fish. The fish-skinner places a fish upon a plank like this and, after stripping off the skin, cuts out the bones and divides the fish into sections to suit the trade.

OLD CUTTING-BOARD FOR BONELESS FISH.

White pine. Three feet long, 21½ inches wide, 2 inches thick. Gloucester, Mass., 1883. 57,858. U. S. Fish Commission. Used in cutting boneless fish.

NAPE-BONE HOOKS.

Iron hooks, with bent shank, set in pine handle. Length, 8¼ inches. Gloucester, Mass., 1878–'82. 54,694–5. U. S. Fish Commission. Used to tear out the "nape-bones" in the preparation of "boneless" salt fish. One of these hooks was long in use and the handle is encrusted with lime from the dissolving of salt in the operator's hand.

MITER-BOX FOR BONELESS FISH.

Oblong box with top and ends open. Seven cuts 3½ inches apart. Cleats on sides. Length, 30 inches; width, 7½ inches outside, 5½ inside; depth, 5½ inches outside, 3½ inches inside. Gloucester, Mass., 1883. 57,853. U. S. Fish Commission. Used in preparing boneless fish. The fish are packed in the box and cut in sections of equal length.

MITER-BOX FOR ROLY-POLY BONELESS FISH.

Pine wood; open at top and ends; semi-circular at bottom, inside. Length, 5 feet 8 inches; width, outside 7 inches, inside 4½ inches; depth, outside 5½ inches, inside 4 inches. Cleats on sides. Fourteen miter cuts 4½ inches apart; 15 smaller cuts for strings. Gloucester, Mass., 1883. 57,854. U. S. Fish Commission. Used for making roly-poly boneless fish. The fish are put in the box and, after being tied up, are cut into sections.

ROLY-POLY KNIFE.

Steel blade, long, with single edge; pine handle. Length: blade, 17 inches; handle, 5 inches. Gloucester, Mass., 1883. 57,820. U. S. Fish Commission. Used with a miter-box in cutting rolls of "boneless salt fish" into suitable lengths for boxing. This knife is much worn by use.

FISH-SKINNING KNIVES.

Steel blades, single edge, hook-bill tips; 5¾ to 7 inches long; rough, white-pine handles. Gloucester, Mass., 1880–'82. 54,688–93, 57,692. U. S. Fish Commission. This class of knives is exclusively used at Gloucester and other places in extracting bones and cutting off fins in the preparation of "boneless" salt fish. Some of them are much worn by use, and the handles are encrusted with a lime deposit caused by the dissolving of salt in the moisture of the operator's hand.

CUSK-BONING KNIFE.*

Steel blade, short and stout; square tip. Pine handle, covered with lime caused by the dissolving of salt in the operator's hand. Length: blade, 2 inches; handle, 5 inches. Gloucester, Mass., 1882. 54,343. U. S. Fish Commission. This knife was in constant use for eighteen months in extracting bones in the preparation of "boneless salt cusk." The bones of this fish are much tougher than those of cod, and a greater pressure is required to cut them than can be obtained by the use of a longer blade.

BONELESS-FISH COMPRESSOR.

Rod of iron, two feet long, with hoe-shaped piece at end. Serpentine handle with lever. Claw-hook to fit on side of box. Gloucester, Mass., 1883. 57,855. U. S. Fish Commission. Used in packing "compressed" boneless fish.

SISAL SPUN-YARN.

Forty lines, each composed of two strands, and being 60 feet in length, the whole twisted into a loosely laid rope. Gloucester, Mass., 1883. 57,856. U. S. Fish Commission. Used for tying up bundles of dry salt cod fish, &c., for which purpose the lines are cut in sections of suitable length.

FISH BOXES.

Samples in great variety of box-ends branded. Used in manufacture of boxes for boneless fish. Gloucester, Mass. U. S. Fish Commission.

BOXES FOR BONELESS FISH.

Paper boxes, two-pound and three-pound. Boston, Mass. Potter & Wrightington.

---

*For list of splitting-knives, throating and flitching knives, used in the preparation of dry and smoked fish, see Catalogue of Fishery Apparatus used in Capture, &c.

SERIES OF PHOTOGRAPHS, 30 BY 40 INCHES AND 8 BY 10 INCHES, ILLUSTRATING THE PREPARATION OF DRY FISH.

UNLOADING AND DRESSING FISH.

Schooner Hildegarde at Knowlton's wharf unloading cod and other fish; gang of men dressing and splitting the fish for curing. Gloucester, Mass., 1882. Photo. 2,107. U. S. Fish Commission.

DRESSING FRESH COD.

Gang of men on Pew's wharf splitting fresh cod for curing. Gloucester, Mass., 1882. Photo. 2,067. U. S. Fish Commission.

CURING HAKE.

Splitting hake (*Phycis chuss*) at Trefethen's wharf, on House Island. The fish to be afterwards salted and dried. Portland, Me., 1882. Photo. 1,859. U. S. Fish Commission.

FLAKE-YARD.

View of John Pew & Son's flake-yard. Fish on the flakes and teams loading. Gloucester, Mass., 1882. Photo. 1,844. U. S. Fish Commission.

FLAKE-YARD.

View of yard of John Pew & Son's, with flakes for curing dry-salted fish. Gloucester, Mass., 1882. Photo. 1,839. U. S. Fish Commission.

FLAKE-YARD.

View of Trefethen's flake-yard from attic window. Portland, Me., 1882. Photo. 1,862. U. S. Fish Commission.

FISH-FLAKES.

Trefethen's flake-yard, showing tilted flakes and straight ones, one row of each, with men in position. Portland, Me., 1882. Photo. 1,846. U. S. Fish Commission.

FLAKE-YARD.

Trefethen's flake-yard, with men and wheelbarrows in position. Portland, Me., 1882. Photo. 1,855. U. S. Fish Commission.

FLAKE-YARD.

Trefethen's flake-yard, from room, with herring-net menders in the foreground and Sterling's flakes in the distance. Portland, Me., 1882. Photo. 1,854. U. S. Fish Commission.

CURING COD.

"Dumping" of dry fish in dry-fish house. This plan is adopted when fish are soon to be marketed. Portland, Me., 1882. Photo. 1,858. U. S. Fish Commission.

CURING COD.

Kench of Bank cod at Trefethen's sheds waiting to be dried. Portland, Me., 1882. Photo. 1,857. U. S. Fish Commission.

CURING CODFISH.

Shed on wharf of Reed & Gammage, with 500 butts, each 900 pounds capacity, of cod in brine. East Gloucester, Mass., 1882. Photo. 2,038. U. S. Fish Commission.

DRY-FISH INDUSTRY.

Unloading, culling, weighing, and wheeling Grand Bank codfish at Parmenter's wharf. Gloucester, Mass., 1882. U. S. Fish Commission.

FISH-FLAKES.

Top of E. G. Willard's buildings, covered with flakes for drying fish. Portland, Me., 1882. Photo. 1,851. U. S. Fish Commission.

STORE-HOUSE FOR DRY FISH.

Willard's store-room, with kenches of dry-salted cod. Portland, Me., 1882. Photo. 1,850. U. S. Fish Commission.

FLAKE-YARD.

Shute & Merchant's flake-yard, with dry fish stacked in faggots. Gloucester, Mass., 1882. Photo. 2,026. U. S. Fish Commission.

DRYING CODFISH.

Fish-flakes on wharf of Sylvanus Smith, with 500 quintals of cod spread out to dry. Gloucester, Mass., 1882. Photo. 2,028. U. S. Fish Commission.

BONELESS FISH FACTORY.

Interior of John Pew & Son's "skinning-room," with men at work preparing boneless dry-salted fish. Gloucester, Mass., 1882. Photos. 1,841–3. U. S. Fish Commission.

DRYING FISH.

Indians drying salmon at Salmon-Breeding Station, McCloud River, California, 1882. U. S. Fish Commission.

CHINESE CURING FISH.

California Chinese curing their fish. Monterey, Cal. U. S. Fish Commission.

APPARATUS FOR PREPARING AND PACKING SMOKE-DRIED FISH.

HERRING SMOKE-HOUSE.

Model. Shows in miniature all the appliances used in the preparation of smoked herring at Eastport, Me. U. S. Fish Commission.

FISH-BOXES.

For boneless smoked herring. One-pound wooden boxes and 1-pound cans. Boston, Mass. Potter & Wrightington.

SERIES OF PHOTOGRAPHS, 30 BY 40 INCHES AND 8 BY 10 INCHES, ILLUSTRATING THE PREPARATION OF SMOKED FISH.

HERRING SMOKING.

Herring-house filled with smoked herring on the way to packing-room. Smoke-house in background. Eastport, Me., 1882. Photo. 1,885. U. S. Fish Commission.

HERRING SMOKE-HOUSE.

Eastport herring smoke-house, showing slides for landing the fish. Eastport, Me., 1882. Photo. 1,899. U. S. Fish Commission.

HERRING SMOKE-HOUSE.

Two herring smoke-houses of Mr. Buck. Eastport, Me., 1882. Photo. 1,886. U. S. Fish Commission.

HERRING SMOKE-HOUSE.

Smoke-house of Mr. Buck, with herring boxes, horses, wood, &c., in foreground. Eastport, Me., 1882. Photo. 1,884. U. S. Fish Commission.

HERRING SMOKE-HOUSE.

Group of smoke-houses, Lubec, Me., 1882. Photo. 1,924. U. S. Fish Commission.

SMOKE-HOUSES.

Row of herring smoke-houses, from water side at high tide. Lubec, Me., 1882. Photo. 1,922. U. S. Fish Commission.

HERRING SMOKE-HOUSE.

Large smoke-house with two windows open, and herring houses in foreground. Lubec, Me., 1882. Photo. 1,923. U. S. Fish Commission.

HADDOCK SMOKING.

Haddock (*Melanogrammus æglefinus*) draining ready for smoking at Joseph Farris's factory, Eastport, Me., 1882. Photo. 1,931. U. S. Fish Commission.

HADDOCK SMOKING.

Haddock (*Melanogrammus æglefinus*) in house, ready for smoking. Eastport, Me. U. S. Fish Commission.

HALIBUT SMOKING.

Shute and Merchant's halibut smoke-houses, showing interior with halibut hung up to smoke. Flakes in foreground with dried flitches of halibut ready for smoking. Gloucester, Mass., 1882. Photo. 2,029. U. S. Fish Commission.

SMOKED HALIBUT INDUSTRY.

Kenches and butts of Greenland flitched halibut ready for drying and smoking, in buildings of W. H. Wonson & Sons. Gloucester, Mass., 1882. Photo. 1,969. U. S. Fish Commission.

SMOKED HALIBUT INDUSTRY.

Flitches of salted halibut on the flakes at W. H. Wonson & Sons' wharf, drying before going to the smoke-house. Gloucester, Mass., 1882. Photo. 1,970. U. S. Fish Commission.

4. PRESERVATION BY BRINE SALTING.

APPARATUS USED IN PACKING PICKLED FISH.

MACKEREL PACKING-CRIB.

Model. Used in pickling and packing mackerel. Gloucester, Mass. 56,961. U. S. Fish Commission.

MACKEREL CULLING-CRIB.

Model. Used in sorting mackerel preparatory to packing in barrels under the standard legal grades. Gloucester, Mass. 56,960. U. S. Fish Commission.

MACKEREL KNIVES.

(For list of mackerel splitting knives and reamers used in preparation of salt mackerel, see Catalogue of Fishery Apparatus.)

MACKEREL BRAND-KETTLE.

Iron; cylindrical, with closed bottom and perforated sides near bottom; cover for top; brass heads, or brand, of circular form, with raised letters five-eighths inch long. Depth of kettle, 12 inches; diameter, 9 inches; diameter of head, 6 inches. Gloucester, Mass., 1883. 57,860. U. S. Fish Commission. Used for branding mackerel barrels.

WOODEN HORSE FOR BRANDING-KETTLE.

Wood; four legs (two at each end), braced at top; slot in top of horse for branding-kettle handle. Three feet high, 3 feet long.

WOODEN HORSE FOR BRANDING-KETTLE—Continued.

Gloucester, Mass., 1883. 57,862. U. S. Fish Commission. Used for the purpose of holding branding-kettle when it has a fire kindled in it.

FOUR BRASS NUMBERS.

1, 2, 3, 4, ¾ of an inch long. Gloucester, Mass., 1883. 57,861. U. S. Fish Commission. These are for the purpose of insertion in the head of the brand-kettle to mark the quality of fish.

BUNDLE OF BLOCK ISLAND FLAGS.

Weight 5 pounds; length 7⅓ feet. Gloucester, Mass., 1883. 57,825. U. S. Fish Commission. Used for tightening barrel-heads.

FLAGGING IRON.

Iron, horseshoe shaped head, with handle flattened at end. Length, 21 inches. Gloucester, Mass., 1883. 57,824. U. S. Fish Commission. Used for the purpose of putting flags in the chines of fish barrels in order to make the latter water-tight.

LONG BILGE CAN-HOOKS.

Two iron rods with hooks attached to lower ends, and a manila-rope strap spliced with eyes at upper ends. Length of rods, 2½ feet; rope strap (¾-inch manila), 4½ feet; hooks, 2½ inches wide. Gloucester, Mass., 1883. 57,834. U. S. Fish Commission. Used for lifting barrels which have one head out and are full of fish and brine.

BARREL-LIFTERS.

Two galvanized iron can-hooks, with hollow, cylindrical-shaped handles. Length of hooks, 4½ inches; width, 2½ inches; handle, 4½ inches. Middletown, Conn. 56,891. Wilcox, Crittenden & Co. Used for stowing mackerel barrels in a vessel's hold, also for loading barrels on cars. One hook is held in each hand and hooked into the chines of a barrel; the knee is then pressed against the bilge and the barrel is easily lifted without cutting the fingers.

WAUKEGAN FISHERY.

Model. This model shows in miniature all the apparatus employed in cleaning and salting down the Lake whitefish (*Coregonus clupeiformis*). Waukegan, Ill. 25,750. Collected by J. W. Milner.

SERIES OF PHOTOGRAPHS, 30 BY 40 INCHES AND 8 BY 10 INCHES, ILLUSTRATING THE PREPARATION OF BRINE-SALTED FISH.

PACKING MACKEREL.

Mackerel vessel with supply of empty barrels on deck for packing salt mackerel. Starting on a trip. Boston, Mass., 1882. Photo. 1,807. U. S. Fish Commission.

PACKING FISH.

Interior of store-house and packing-room for pickled fish. Sandusky, Ohio, 1882. Photo. 2,204. U. S. Fish Commission.

PACKING MACKEREL.

Room at E. G. Willard's for packing brine-salted mackerel. Portland, Me., 1882. Photo. 1,849. U. S. Fish Commission.

PACKING MACKEREL.

E. H. Chase's mackerel packing-room. Sorting table, weighing scales and tubs, all full. Portland, Me., 1882. Photo. 1,853. U. S. Fish Commission.

PACKING MACKEREL.

E. H. Chase's mackerel packing-room; very complete; built July, 1882. Portland, Me., 1882. Photo. 1,852. U. S. Fish Commission.

PACKING MACKEREL.

Pickling and branding barrels of mackerel at John Pew & Son's wharf. Gloucester, Mass., 1882. Photo. 1,846. U. S. Fish Commission.

INSPECTION OF MACKEREL.

Culling and inspecting brine-salted mackerel at wharf of Franklin Snow & Co. Boston, Mass., 1882. Photo. 1,816. U. S. Fish Commission.

PACKING MACKEREL.

Table or trough for fish, salt measures, weighing scales, and barrels. Portland, Me., 1882. Photo. 1,871. U. S. Fish Commission.

DRESSING MACKEREL.

Schooner Frank Foster, of Gloucester, at wharf with 200 barrels of mackerel on deck, caught a few hours previous off Eastern Point, and 150 barrels of salt mackerel in the hold; crew hard at work splitting, gibbing, and salting the fish in barrels. Views of deck on port and starboard sides, and view of whole scene. Photos. 1,966–8. U.S. Fish Commission.

PACKING MACKEREL.

Gang of men on Leighton's wharf, culling, salting, and packing mackerel in barrels. Gloucester, Mass., 1882. Photos. 2,073–5. U. S. Fish Commission.

DRESSING ALEWIVES.

Negroes cleaning alewives preparatory to brine-salting them in barrels. North Carolina. U. S. Fish Commission.

DRESSING FISH.

Cleaning and cutting up fresh fish for packing at establishment of Post & Co. Sandusky, Ohio, 1882. Photo. 2,198. U. S. Fish Commission.

PACKING FISH.

Interior of packing house showing dressed fish ready to salt and pack. Sandusky, Ohio, 1882. Photo. 2,202. U. S. Fish Commission.

SHELLING CLAMS.

Scene on the beach at Essex River; dories unloading clams, and men and boys near clam houses shelling clams and salting in barrels for bait. Essex, Mass., 1882. Photo. 1,961. U. S. Fish Commission.

5. PRESERVATION BY CANNING.

MODELS OF CANNERIES AND CANNING TOOLS.

SARDINE CANNERY.

Model of cannery of Union Fish Company, showing the interior arrangements on each floor for canning sardines or small herring (*Clupea harengus*). Miniature models of the cans, soldering implements, &c., are shown in position. Camden, Me. Gift of Henry Sellman.

OYSTER CANNERY.

(For list of apparatus and description of methods employed in canning oysters, see Section D, Catalogue of Mollusca.)

COTTON-SEED OIL AND ITS PREPARATION.

The refined oil is sometimes used instead of olive oil in oil sardines.

COTTON SEED.

Before linting. Selma, Ala. 57,501. Presented by George O. Baker & Co.

COTTON SEED.

After linting. Selma, Ala. 57,502. Presented by George O. Baker & Co.

COTTON SEED.

After passing through huller. Selma, Ala. 57,503. Presented by George O. Baker & Co.

COTTON-SEED KERNEL.

Separated from hull. Selma, Ala. 57,504. Presented by George O. Baker & Co.

COTTON-SEED HULLS.

The hull of the cotton seed when burned makes a fine ingredient for fertilizing. In some sections the dairymen use them largely in feeding cows, mixing cotton-seed meal with them. They are also a good fertilizer by themselves if properly used. Analysis: Phosphoric acid, 10.89; potash, 14.70. Selma, Ala. 57,505. Presented by George O. Baker & Co.

COTTON-SEED KERNEL.

Crushed but not cooked. Selma, Ala. 57,508. Presented by George O. Baker & Co.

COTTON-SEED KERNEL.

Crushed and cooked. Selma, Ala. 57,507, Presented by George O. Baker & Co.

LINT FROM COTTON SEED.

Used in carpet linings, also in mattresses, comforters, &c. Selma, Ala. 57,510. Presented by George O. Baker & Co.

COTTON-SEED CAKE.

After the oil is taken out. Selma, Ala. 57,506. Presented by George O. Baker & Co.

COTTON-SEED MEAL.

Ground from the cake. "Analysis and experience proves that it is a most nutritious and highly concentrated food. Some consider it superior to corn as a milk producer." It is also used as a fertilizer. Selma, Ala. 57,509. Presented by George O. Baker & Co.

CRUDE COTTON-SEED OIL.

Selma, Ala. 57,511. Presented by George O. Baker & Co.

REFINED COTTON-SEED OIL.

Sold as olive oil, and under the name of olive butter; used in the place of lard for cooking purposes. It also takes the place of olive oil in packing sardines. Selma, Ala. 57,512. Presented by George O. Baker & Co.

SAMPLES OF TIN BOXES USED IN CANNING MARINE PRODUCTS.

FOR PRODUCTS PLAIN-BOILED, OR FRIED.

FRESH HADDOCK.

Round can. Height, 4 inches; diameter, 5 inches. Boston, Mass. 54,793. E. T. Cowdrey & Co.

FRESH CODFISH.

Half dozen 2-pound cans. Boston, Mass. L. Pickert & Co.

PLAIN BOILED COD.

Round can. Height, 4 inches; diameter, 4½ inches. Boston, Mass. 54,792. William Underwood & Co.

PLAIN BOILED COD.

Round can. Height, 3 inches; diameter, 4 inches. Boston, Mass. 54,791. Henry Mayo & Co.

PLAIN BOILED COD.

Round can. Height, 3⅜ inches; diameter, 4½ inches. Boston, Mass. 54,790. Henry Mayo & Co.

FRESH CODFISH.

Round can. Height, 4 inches; diameter, 5 inches. Boston, Mass. 54,789. E. T. Cowdrey & Co.

FRESH CODFISH.

Round cans. Height, 3⅝ inches; diameter, 4¾ inches. Boston, Mass. 54,788. E. T. Cowdrey & Co.

FRESH COD.

One-pound round cans. Boston, Mass. Potter & Wrightington.

FRESH CUSK.

Round can. Height, 3⅝ inches; diameter, 4¾ inches. Boston, Mass. 54,903. Henry Mayo & Co.

FRESH SEA-BASS.

One dozen 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

FRESH BLUE-FISH.

Half dozen 1-pound cans. Boston, Mass. L. Pickert & Co.

FRESH BLUE-FISH.

One dozen 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

FRIED SMELTS.

Half dozen 2-pound cans. Boston, Mass. L. Pickert & Co.

FRIED BROOK-EELS.

Oval can, 4½ by 3½ by 2 inches. Camden, Me. 54,921. Union Fish Company.

"OCEAN-TROUT." (Sea-herring.)

One-pound round cans. Boston, Mass. Potter & Wrightington.

FRESH HERRING.

One-pound round cans. Boston, Mass. Potter & Wrightington.

CANNED HALIBUT.

Oval cans. New York. Hine & Co., 13 and 15 Doyers street.

FRESH HALIBUT.

Round can. Height, 3 inches; diameter, 4½ inches. Sitka, Alaska. 54,975. Cutting Packing Company.

"BROOK-TROUT." (Small sea-herring.)

Half dozen 3-pound cans. Boston, Mass. L. Pickert & Co.

"OCEAN-TROUT." (Sea-herring.)

Oval can, 5½ by 3½ by 3 inches. Port Monmouth, Me. 54,947. Ocean-Trout Company.

FRIED "SEA-TROUT." (Sea-herring.)

Oval can, 4½ by 3½ by 2 inches. Eastport, Me. 54,918. Eagle Preserved Fish Company.

FRESH HERRING.

One dozen 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

CANNED SALMON.

Oval cans. New York. Hine & Co., 13 and 15 Doyers street.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4⅝ inches. New York. 54,759. H. K. & F. B. Thurber & Co.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,756. W. K. Lewis & Brother.

FRESH SALMON.

Round can. Height, 4 inches; diameter, 5 inches. Boston, Mass. 54,761. E. T. Cowdrey & Co.

FRESH SALMON.

Round can. Height, 3⅜ inches; diameter, 4⅛ inches. Boston, Mass. 54,762. E. T. Cowdrey & Co.

DEEP-SEA SALMON.

One dozen 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

FRESH SALMON.

One-pound round cans. Boston, Mass. Henry Mayo & Co.

FRESH PROVINCE SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,953. J. Winslow Jones.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,780. J. Winslow Jones.

FRESH SALMON.

Round can. Height, 4½ inches; diameter, 2½ inches. Labrador; Portland, Me. 54,781. J. Winslow Jones.

FRESH SALMON.

Round can. Height, 4½ inches; diameter, 2½ inches. San Francisco, Cal. 54,769. Columbia River Packing Company.

FRESH SALMON.

Round can. Height, 4½ inches; diameter, 4½ inches. San Francisco, Cal. 54,763. California Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 5 inches. San Francisco, Cal. 54,760. Dickson, De Wolf & Co.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. San Francisco, Cal. 54,755. Eureka Packing Company.

FRESH SALMON.

Round can. Height, 4 inches; diameter, 4¾ inches. Portland, Oregon; San Francisco, Cal. 54,757. J. G. Megler & Co.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Oregon; San Francisco, Cal. 54,758. J. G. Megler & Co.

SALMON BELLIES.

Round can. Height, 6 inches; diameter, 4½ inches. San Francisco, Cal. 54,951. Cutting Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4⅓ inches. San Francisco, Cal. 54,765. Cutting Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 2¼ inches. San Francisco, Cal. 54,764. Cutting Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. San Francisco, Cal. 54,770. Cutting Packing Company.

FRESH SALMON.

Round can. Height, 6 inches; diameter, 4½ inches. San Francisco, Cal. 54,768. Cutting Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. San Francisco, Cal. 54,767. Cutting Packing Company.

FRESH SALMON.

One dozen assorted cans for packing Alaska, California, and Oregon salmon. Cutting Packing Company. Office in San Francisco, Cal.

FRESH SALMON.

Round can. Height, 2⅞ inches; diameter, 4½ inches. Astoria, Oregon. 54,754. A. Booth.

FRESH SALMON.

Several cases of 1-pound, 2-pound, and 2½ pound cans. Chicago, Ill. Canneries at Astoria, Oregon. A. Booth.

FRESH SALMON.

Two fish-shaped cans for packing whole fish. Chicago, Ill. Canneries at Astoria, Oregon A. Booth.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,954. Badollet & Co.

FRESH OREGON SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Ellensburg, Ohio. 54,952. Hume & Co.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,782. West Coast Packing Company.

FRESH COLUMBIA-RIVER SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,787. C. Daborich & Co.

FRESH COLUMBIA-RIVER SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,786. Aberdeen Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,783. G. W. Hume.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Knappton, Washington Territory. 54,784. Joseph Hume.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Rogue River; San Francisco, Cal. 54,785. R. D. Hume.

FRESH SALMON.

Round can. Height, 3½ inches; diameter, 4½ inches. Astoria, Oregon. 54,751. Astoria Packing Company.

FRESH SALMON.

Round can. Height, 4 inches; diameter, 2½ inches. Astoria, Oregon. 54,752. Astoria Packing Company.

FRESH SALMON.

Round can. Height, 3½ inches; diameter, 3 inches. Astoria, Oregon. 54,753. Astoria Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,771. West Coast Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,772. West Coast Packing Company. G. W. Hume, agent.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. San Francisco, Cal. 54,773. R. D. Hume.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. San Francisco, Cal. 54,774. R. D. Hume.

FRESH SALMON.

Round can. Height, 4 inches; diameter, 4½ inches. Astoria, Oregon. 54,775. W. S. Kinney.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,776. W. S. Kinney.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,779. Occident Packing Company.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,778. J. Williams & Co.

FRESH SALMON.

Round can. Height, 3 inches; diameter, 4½ inches. Astoria, Oregon. 54,777. Scandinavian Packing Company.

FRESH MACKEREL.

Round can. Height, 4¼ inches; diameter, 2½ inches. Portland, Me. 54,811. J. Winslow Jones.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,812. J. Winslow Jones.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,803. Potter & Wrightington.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,809. E. T. Cowdrey & Co.

FRESH MACKEREL.

Round can. Height, 3⅝ inches; diameter, 4¾ inches. Boston, Mass. 54,808. E. T. Cowdrey & Co.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4⅓ inches. New York. 54,796. Kemp, Day & Co.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4⅓ inches. New York.
54,804. H. K. & F. B. Thurber & Co.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass.
54,801. W. K. Lewis & Brother.

CAPE SHORE MACKEREL.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me.
54,810. Burnham & Morrill.

CAPE SHORE MACKEREL.

Round can. Height, 3½ inches; diameter, 4½ inches. Portland, Me.
54,807. Burnham & Morrill.

FRESH MACKEREL.

One dozen 1-pound round cans. Portland, Me. Burnham & Morrill.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass.
45,802. Henry Mayo & Co.

FRESH MACKEREL.

One dozen 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

FRESH MACKEREL.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass.
54,806. William Underwood & Co.

FRESH MACKEREL.

Perfection brand. Oval can, 4½ by 3 by 2¾ inches. Boston, Mass.
54,805. William Underwood & Co.

SOUSED MACKEREL.

Two-pound round cans. Boston, Mass. Potter & Wrightington.

FRESH CLAMS.

Round can. Height, 3¼ inches; diameter, 4½ inches. Boston, Mass. 54,936. Eastern Packing Company.

FRESH CLAMS (soft shell).

Round can. Height, 3½ inches; diameter, 4½ inches. Boston, Mass.
54,881. Eastern Packing Company.

OLD ORCHARD BEACH CLAMS.

Round can. Height, 4½ inches; diameter, 3 inches. Portland, Me. 54,884. Portland Packing Company.

OLD ORCHARD BEACH CLAMS.

Round can. Height, 4½ inches; diameter, 3½ inches. Portland, Me. 54,883. Portland Packing Company.

FRESH CLAMS.

Globe branch. Round can. Height, 3½ inches; diameter, 4½ inches. Portland, Me. 54,882. J. Winslow Jones.

SCARBOROUGH BEACH CLAMS.

Round can. Height, 3½ inches; diameter, 4½ inches. Boston, Mass. 54,935. Burnham & Morrill.

SCARBOROUGH BEACH CLAMS.

Round can. Height, 8 inches; diameter, 4½ inches. Portland, Me. 54,880. Burnham & Morrill.

FRESH CLAMS.

One dozen 1-pound round cans. Portland, Me. Burnham & Morrill.

FRESH CLAMS.

Half dozen 1-pound cans. Boston, Mass. L. Pickert & Co.

FRESH CLAMS.

One-pound round cans. Boston, Mass. Potter & Wrightington.

LITTLE NECK CLAMS.

Round can. Height, 3½ inches; diameter, 4½ inches. Boston, Mass. 54,875. William Underwood & Co.

PENOBSCOT BAY LITTLE NECK CLAMS.

Round can. Height, 3½ inches; diameter, 4½ inches. Castine, Me. 54,870. Castine Packing Company.

LITTLE NECK CLAMS.

Round can. Height, 2½ inches; diameter, 4 inches. New York. 54,874. Bogert & Co.

LITTLE NECK CLAMS.

Round can. Height, 3⅛ inches; diameter, 4½ inches; Capeville, Virginia. 54,873. J. A. Ketcham & Co.

LITTLE NECK CLAMS.

Round can. Height, 3 inches; diameter, 3⅛ inches. New York. 54,872. Kemp, Day & Co.

ORCHARD BEACH CLAMS.

Round can. Height, 3½ inches; diameter, 4½ inches. New York. 54,871. Kemp, Day & Co.

FRESH CLAMS.

Round can. Height, 6 inches; diameter, 4⅝ inches. Boston, Mass.
54,876. W. K. Lewis & Brother.

LITTLE NECK CLAMS.

Round can. Height, 2½ inches; diameter, 4 inches. Norfolk, Va.
54,877. Maltby & Edwards.

FRESH CLAMS.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass.
54,879. E. T. Cowdrey & Co.

FRESH CLAMS.

Round can. Height, 3½ inches; diameter, 4½ inches. Boston, Mass. 54,878. E. T. Cowdrey & Co.

FRESH COVE OYSTERS.

Round can. Height, 4 inches; diameter, 2¾ inches. New York.
54,852. Kemp, Day & Co.

OYSTERS, STANDARD BRAND.

Round can, 3⅜ by 4½ inches. Baltimore, Md. 54,851. A. Booth.

FRESH COVE OYSTERS.

Round can. Height, 3½ inches; diameter, 4½ inches. Boston, Mass. 54,958. E. T. Cowdrey & Co.

SADDLE ROCK COVE OYSTERS.

Round can. Height, 3½ inches; diameter, 4½ inches. New York.
54,853. H. K. & F. B. Thurber & Co.

LUNCH OYSTERS.

Three cases, twelve dozen empty cans. Baltimore, Md. A. Booth.

COVE OYSTERS.

Three cases, six dozen 1-pound; and three cases, six dozen 2-pound empty cans. Baltimore, Md. A. Booth.

SCALLOPED OYSTERS.

Oval cans. New York. Hine & Co., 13 and 15 Doyers street.

OLD RELIABLE OYSTERS.

Oval cans, 6 by 4½ by 1¾ inches. Baltimore, Md. 54,868. C. S. Maltby.

FRESH COVE OYSTERS.

Round can. Height, 4 inches; diameter, 2½ inches. Baltimore, Md. 54,867. C. S. Maltby.

FRESH COVE OYSTERS.

Round can. Height, 4½ inches; diameter, 3½ inches. Baltimore, Md. 54,866. C. S. Maltby.

STANDARD OYSTERS.

Round can. Height, 2⅞ inches; diameter, 4 inches. Baltimore, Md. 54,855. Union Oyster Company.

STANDARD OYSTERS.

Round can, 3¾ by 4⅝ inches. Baltimore, Md. 54,854. Union Oyster Company.

FRESH COVE OYSTERS (Beauties of Hampton Roads).

Hampton, Va. 54,864. T. T. Bryce.

FRESH COVE OYSTERS.

Round can. Height, 3⅜ inches; diameter, 4½ inches. Hampton, Va. 54,863. T. T. Bryce.

SELECTED COVE OYSTERS.

Round can. Height, 3⅜ inches; diameter, 4½ inches. Hampton, Va. 54,862. T. T. Bryce.

FRESH COVE OYSTERS.

Round can. Height, 2⅝ inches; diameter, 4 inches. Hampton, Va. 54,861. T. T. Bryce.

FRESH COVE OYSTERS.

Round can. Height, 3⅜ inches; diameter, 4½ inches. Hampton, Va. 54,860. T. T. Bryce.

SELECTED COVE OYSTERS.

Round can. Height, 2¾ inches; diameter, 4 inches. Hampton, Va. 54,859. T. T. Bryce.

HAMPTON ROADS OYSTERS.

Round can. Height, 2¾ inches; diameter, 4 inches. Hampton, Va. 58,959. McMenamin & Co.

OYSTERS.

Hampton Roads brand. Round can. Height, 2¾ inches; diameter, 4 inches. Hampton, Va. 54,932. McMenamin & Co.

LUNCH OYSTERS.

Two packages; small flat cans. Hampton, Va. McMenamin & Co.

EXTRA COVE OYSTERS.

Hampton Roads brand. Two packages; round cans. Hampton, Va. McMenamin & Co.

COVE OYSTERS.

Hampton Roads brand. Two packages of assorted sizes; round cans. Hampton, Va. McMenamin & Co.

EXTRA SELECTED OYSTERS.

Lion brand. Two packages of assorted sizes; round cans. Hampton, Va. McMenamin & Co.

HAMPTON ROADS OYSTERS.

Round can. Height, $3\frac{3}{8}$ inches; diameter, $4\frac{1}{2}$ inches. Hampton, Va. 54,865. McMenamin & Co.

FRESH COVE OYSTERS.

Round can. Height, $3\frac{1}{2}$ inches; diameter, $4\frac{1}{2}$ inches. Baltimore, Md. 54,934. Platt & Co.

FRESH COVE OYSTERS.

Round can. Height, $2\frac{3}{4}$ inches; diameter, 4 inches. Baltimore, Md. 54,933. Platt & Co.

LOUISIANA COVE OYSTERS.

Round can. Height, $2\frac{3}{4}$ inches; diameter, 4 inches. New Orleans, La. 54,858. G. W. Dunbar's Sons.

LOUISIANA COVE OYSTERS.

Round can. Height, $3\frac{1}{2}$ inches; diameter, $4\frac{3}{4}$ inches. New Orleans, La. 54,857. G. W. Dunbar's Sons.

FRESH BARATARIA OYSTERS.

Round can. Height, $3\frac{1}{2}$ inches; diameter, $4\frac{3}{4}$ inches. New Orleans, La. 54,856. G. W. Dunbar's Sons.

ROYAL LOBSTER.

Round can. Height, 3 inches; diameter, $4\frac{1}{2}$ inches. Eastport, Me. 54,817. Eastport Packing Company.

PORTLAND LOBSTER.

Round can. Height, 3 inches; diameter, $4\frac{1}{2}$ inches. Portland, Me. 54,955. Maine Packing Company.

EGMONT BAY LOBSTER.

Round can. Height, 3 inches; diameter, $4\frac{1}{2}$ inches. New York. 54,819. H. K. & F. B. Thurber & Co.

FRESH LOBSTER.

Round can. Height, 3 inches; diameter, $4\frac{1}{2}$ inches. New York. 54,818. Kemp, Day & Co.

FRESH LOBSTER.

Six cases, twelve dozen 1-pound round cans. Portland, Me. Portland Packing Company.

FRESH LOBSTER.

One-pound round cans. Boston, Mass. Henry Mayo & Co.

FRESH LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,822. Potter & Wrightington.

FRESH LOBSTER.

One-pound round cans. Boston, Mass. Potter & Wrightington.

FRESH LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,827. E. T. Cowdrey & Co.

FRESH LOBSTER.

Round can. Height, 3½ inches; diameter, 4¾ inches. Boston, Mass. 54,826. E. T. Cowdrey & Co.

FRESH LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,820. William Underwood & Co.

FRESH LOBSTER.

Round can. Height, 3½ inches; diameter, 4 inches. Boston, Mass. 54,823. William Underwood & Co.

FRESH BAY LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,825. J. Winslow Jones.

FRESH BAY LOBSTER.

Round can. Height, 4¼ inches; diameter, 2½ inches. Portland, Me. 54,832. J. Winslow Jones.

FRESH BAY LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,834. J. Winslow Jones.

FRESH BAY LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,837. J. Winslow Jones.

PORTLAND LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,840. J. Winslow Jones.

FRESH BAY LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,838. William Wortley Jones.

FRESH LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Boston, Mass. 54,821. W. K. Lewis & Bros.

FRESH LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Castine, Me. 54,841. Castine Packing Company.

FRESH LOBSTER.

Round can. Height, 4¼ inches; diameter, 2½ inches. Portland, Me. 54,828. Burnham & Morrill.

FRESH LOBSTER.

Round can. Height, 3 inches; diameter, 4½ inches. Portland, Me. 54,824. Burnham & Morrill.

FRESH LOBSTER.

Queen brand. Round can. Height, 4¼ inches; diameter, 2½ inches. Portland, Me. 54,829. Burnham & Morrill.

FRESH LOBSTER.

Homards de la Reine. Round can. Height, 4¼ inches; diameter, 2½ inches. 54,830. Burnham & Morrill.

FRESH LOBSTER.

One dozen 1-pound flat and 1-pound tall cans. Portland, Me. Burnham & Morrill.

MACHIAS BAY LOBSTER.

Round can. Height, 3½ inches; diameter, 4½ inches. Portland, Me. 54,831. Burnham & Morrill.

FRESH LOBSTER.

Half dozen 1-pound cans. Boston, Mass. L. Pickert & Co.

FRESH HARD CRABS.

Round can. Height, 3⅜ inches; diameter, 4⅝ inches. Hampton, Va. 54,843. McMenamin & Co.

FRESH HARD CRABS.

Round can. Height, 3½ inches; diameter, 4½ inches. Baltimore, Md. 54,957. Maryland Packing Company.

FRESH HARD CRABS.

Round can. Height, 3 inches; diameter, 4 inches. Baltimore, Md. 54,956. Maryland Packing Company.

FRESH HARD CRABS.

Round can. Height, $2\frac{3}{4}$ inches; diameter, 4 inches. Hampton, Va. 54,846. McMenamin & Co.

FRESH CRAB MEAT.

Two packages assorted sizes, round cans. Hampton, Va. McMenamin & Co.

FRESH CRAB MEAT.

Round can. Height, $2\frac{5}{8}$ inches; diameter, 4 inches. Hampton, Va. 54,845. T. T. Bryce.

FRESH CRAB MEAT.

Round can. Height, $3\frac{1}{4}$ inches; diameter, $4\frac{1}{2}$ inches. Hampton, Va. 54,844. T. T. Bryce.

GREEN TURTLE.

Round can. Height, $3\frac{1}{4}$ inches; diameter, $4\frac{1}{2}$ inches. Norfolk, Va. 54,894. Maltby & Edwards.

GREEN TURTLE MEAT.

Round can. Height, $4\frac{1}{4}$ inches; diameter, 5 inches. New York. 54,893. H. K. & F. B. Thurber & Co.

BARATARIA PRAWNS.

Round can. Height, $3\frac{1}{2}$ inches; diameter, $2\frac{1}{4}$ inches. 54,892. G. W. Dunbar's Sons.

BARATARIA SHRIMP.

Round can. Height, $3\frac{1}{2}$ inches; diameter, $3\frac{5}{8}$ inches. New Orleans, La. 54,890. G. W. Dunbar's Sons.

BARATARIA SHRIMP.

Round can. Height, $3\frac{1}{2}$ inches; diameter, $2\frac{1}{2}$ inches. New Orleans, La. 54,891. G. W. Dunbar's Sons.

FOR PRODUCTS BOILED WITH VEGETABLES, ETC.

GREEN TURTLE STEW.

Oval cans. New York. Hine & Co., 13 and 15 Doyers street.

GREEN TURTLE SOUP.

Oval cans. New York. Hine & Co., 13 and 15 Doyers street.

TERRAPIN STEW.

Oval cans. New York. Hine & Co., 13 and 15 Doyers street.

TERRAPIN SOUP.

Oval cans. New York. Hine & Co., 13 and 15 Doyers street.

FISH CHOWDER.

Three-pound round cans. Boston, Mass. Henry Mayo & Co.

FISH CHOWDER.

One dozen 3-pound round cans. Boston, Mass. A. H. Bailey & Co.

NEW ENGLAND FISH CHOWDER.

Round can. Height, 4¼ inches; diameter, 4¼ inches. Boston, Mass. 54,896. William Underwood & Co.

BOSTON FISH CHOWDER.

Round can. Height, 4¼ inches; diameter, 5 inches. Boston, Mass. 54,895. Henry Mayo & Co.

BOSTON CODFISH BALLS.

Round can. Height, 3⅝ inches; diameter, 5¾ inches. Boston, Mass. 54,902. Henry Mayo & Co.

CODFISH BALLS.

Two-pound round cans. Boston, Mass. Henry Mayo & Co.

CODFISH CHOWDER.

Two-pound and 3-pound cans. Boston, Mass. Potter & Wrightington.

MINCED COD.

One-pound round cans. Boston, Mass. Potter & Wrightington.

SCARBOROUGH BEACH CLAM CHOWDER.

Round can. Height, 4¼ inches; diameter, 4¾ inches. Portland, Me. 54,899. Burnham & Morrill.

NEW ENGLAND CLAM CHOWDER.

Round can. Height, 4¼ inches; diameter, 4⅞ inches. Boston, Mass. 54,898. William Underwood & Co.

BOSTON CLAM CHOWDER.

Round can. Height, 4¼ inches; diameter, 4⅞ inches. Boston, Mass. 54,897. Henry Mayo & Co.

CLAM CHOWDER.

Two-pound and 3-pound round cans. Boston, Mass. Potter & Wrightington.

CLAM CHOWDER.

One dozen 3-pound round cans. Boston, Mass. A. H. Bailey & Co.

CLAM CHOWDER.

Half dozen 3 pound cans. Boston, Mass. L. Pickert & Co.

CLAM CHOWDER.

Round can. Height, 3½ inches; diameter, 4½ inches. Boston, Mass.
54,937. William Underwood & Co.

BAY STATE CLAM CHOWDER.

Round can. Height, 4¼ inches; diameter, 5 inches. Boston, Mass.
54,901. E. T. Cowdrey & Co.

BAY STATE CLAM CHOWDER.

Round can. Height, 3¼ inches; diameter, 4½ inches. Boston, Mass.
54,900. E. T. Cowdrey & Co.

CLAM CHOWDER.

Three-pound round cans. Boston, Mass. Henry Mayo & Co.

FOR PRODUCTS CANNED IN BRINE, WITH HEAT.

AMERICAN CAVIARE.

Round can. Height, 3 inches; diameter, 4½ inches. New York.
54,886. Max Ams.

PRIME RUSSIAN CAVIARE.

Round can. Height, 3½ inches; diameter, 4½ inches. New York.
54,888. Max Ams.

PRIME RUSSIAN CAVIARE.

Round can. Height, 3 inches; diameter, 4½ inches. New York.
54,889. Max Ams.

FOR PRODUCTS CANNED IN BRINE, WITHOUT HEAT.

SEGUIN MACKEREL.

Round can. Height, 4½ inches; diameter, 3½ inches. Portland, Me.
54,814. Portland Packing Company.

FAMILY MESS MACKEREL.

In brine. Oval can, 7⅞ by 5⅞ by 3⅜ inches. Boston, Mass. 54,922.
Boston Packing Company.

LION AND UNICORN MESS MACKEREL.

Five pound round cans. Boston, Mass. Potter & Wrightington.

BREAKFAST MESS MACKEREL.

Round can. Height, 3½ inches; diameter, 8¾ inches. Boston,
Mass. 54,790. Potter & Wrightington.

PRIZE MESS MACKEREL.

Five-pound round and oval cans. Boston, Mass. Potter & Wrightington.

MINOT'S LIGHT BREAKFAST MESS MACKEREL.

Five-pound round cans. Boston, Mass. Potter & Wrightington.

PARAGON MESS MACKEREL.

Samples of 5-pound cans. Boston, Mass. Henry Mayo & Co.

FAMILY MESS MACKEREL.

Samples of 5-pound cans. Boston, Mass. Henry Mayo & Co.

BREAKFAST MESS MACKEREL.

Samples of 5-pound cans. Boston, Mass. Henry Mayo & Co.

STANDARD MESS MACKEREL.

Samples of 5-pound cans. Boston, Mass. Henry Mayo & Co.

PERFECTION MESS MACKEREL.

Round can. Height, $4\frac{1}{2}$ inches; diameter, 8 inches. Boston, Mass. 54,797. Henry Mayo & Co.

CHOICE FAT MACKEREL.

Round can. Height, $4\frac{5}{8}$ inches; diameter, $6\frac{3}{8}$ inches. Boston, Mass. 54,799. Franklin Snow & Co.

DEEP-SEA MACKEREL.

Round can. Height, $3\frac{1}{2}$ inches; diameter, $8\frac{3}{4}$ inches. New York. 54,800. H. K. & F. B. Thurber & Co.

NONPAREIL SALT MACKEREL.

Half-dozen cans. Boston, Mass. L. Pickert & Co.

ISLES OF SHOALS SALT MACKEREL.

Half-dozen cans. Boston, Mass. L. Pickert & Co.

CLIMAX SALT MACKEREL.

Half-dozen cans. Boston, Mass. L. Pickert & Co.

DIADEM SALT MACKEREL.

Half-dozen cans. Boston, Mass. L. Pickert & Co.

CORNED CODFISH.

Samples of 2-pound cans for packing brine-salted codfish. Boston, Mass. L. Pickert & Co.

FOR PRODUCTS CANNED IN SPICES, SAUCES, ETC.

SPICED "BROOK TROUT." (Small sea herring.)

Oval can, 4½ by 9½ by 2 inches. Eastport, Me. 54,917. Eagle Preserved Fish Company.

"OCEAN TROUT." (Sea herring.)

In tomato sauce. One-pound oblong cans. Boston, Mass. Potter & Wrightington.

FRESH HERRING.

In tomato sauce. Three-pound oval cans. Boston, Mass. Potter & Wrightington.

"OCEAN TROUT." (Sea herring.)

In tomato sauce. Three-pound oval cans. Boston, Mass. Potter & Wrightington.

MACKEREL.

In tomato sauce. One dozen 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

SOUSED HERRING.

Three-pound oval cans. Boston, Mass. Potter & Wrightington.

SOUSED OR SPICED "OCEAN TROUT." (Sea herring.)

One dozen 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

"OCEAN TROUT." (Sea herring.)

In tomato sauce. One dozen 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

"OCEAN TROUT." (Sea herring.)

In mustard sauce. One dozen 2-pound round cans. Boston, Mass. A. H. Bailey & Co.

SOUSED "TROUT." (Sea herring.)

In 3-pound oval cans. Boston, Mass. Potter & Wrightington.

SOUSED MACKEREL.

Half-dozen 1-pound and 3-pound cans. Boston, Mass. L. Pickert & Co.

SOUSED MACKEREL.

Assorted sizes of round and oval cans. Boston, Mass. Henry Mayo & Co.

SOUSED OR SPICED MACKEREL.

One dozen 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

FRESH MACKEREL.

In mustard sauce. Two-pound square and 3-pound round cans. Boston, Mass. Henry Mayo & Co.

MACKEREL.

In mustard sauce. One dozen 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

FRESH MACKEREL.

In tomato sauce. Two-pound square and 3-pound round cans. Boston, Mass. Henry Mayo & Co.

MARINÉE SARDINES.

Sample of oblong cans. Eastport, Me. Wolff & Riesing.

SARDINES ROYALES AROMATIQUE.

Oblong can, 2 by 2 by 4½ inches. New York. 54,905. American Sardine Company.

MUSTARD SARDINES.

Oblong can, 2 by 2 by 4½ inches. New York. 54,904. American Sardine Company.

MUSTARD SARDINES.

Oblong can, 3½ by 4½ by 2 inches. New York. 54,908. Hausen & Drickman.

MUSTARD SARDINES.

Oblong can, 4½ by 3½ by 2 inches. Eastport, Me. 54,909. Eagle Preserved Fish Company.

MUSTARD SARDINES.

Samples of ¼ and 1/1 cans. Camden, Me. Office, 323 Greenwich street, New York. Rosenstein Bros.

SPICED SARDINES.

Royal brand. Samples of 1/1 cans. Camden, Me. Office, 323 Greenwich street, New York. Rosenstein Bros.

MUSTARD SARDINES.

Samples of oblong cans. Eastport, Me. Wolff & Riesing.

NANTUCKET STURGEON IN PICCALILLI DRESSING.

One dozen 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

SPICED SALMON.

Round can. Height, 4¼ inches; diameter, 2¼ inches. Portland, Me. 54,906. J. Winslow Jones.

SPICED SALMON.

Globe brand. Round can. Height, 4¼ inches; diameter, 2¼ inches. Portland, Me. 54,907. J. Winslow Jones.

CURRIED OYSTERS.

Round can. Height, 3½ inches; diameter, 2 inches. New York. 54,869. H. K. & F. B. Thurber & Co.

ORIGINAL DEVILED LOBSTER.

Round can. Height, 3 inches; diameter, 2⅓ inches. Boston, Mass. 54,842. William Underwood & Co.

FRESH DEVILED CRABS.

Two packages, assorted sizes, round cans. Hampton, Va. McMenamin & Co.

DEVILED CRABS.

Round can, 2½ by 4 inches. Norfolk, Va. 54,849. Maltby & Edwards.

DEVILED CRABS.

Round can. Height, 3½ inches; diameter, 4½ inches. Hampton, Va. 54,847. McMenamin & Co.

DEVILED CRABS.

Round can. Height, 3½ inches; diameter, 4 inches. Hampton, Va. 54,848. McMenamin & Co.

FOR PRODUCTS CANNED IN VINEGAR.

PICKLED LOBSTER.

Round can. Height, 3 inches; diameter, 6½ inches. Boston, Mass. 54,926. E. T. Cowdrey & Co.

FLORIDA PICKLED SHRIMPS.

Round can. Height, 6 inches; diameter, 2½ inches. New York. 54,927. H. K. & F. B. Thurber & Co.

FOR PRODUCTS CANNED IN OIL.

HOWE & ODELL SARDINES.

Oblong can, 5⅞ by 3⅞ by 2 inches. New York. 54,919. Howe & Odell.

SARDINES IN OIL.

"Alexis Codellot." Oblong can, 4½ by 3½ by 1½ inches. 54,938.

"SARDINES À L'HUILE D'OLIVE."

Oblong can, 4½ by 3 by 1½ inches. Eastport, Me. 54,920. Heman & Banister.

SARDINES.

"Alexandre Grenier." Oblong can, 4½ by 3½ by 1 inch. Eastport, Me. 54,915. Eagle Preserved Fish Company.

SARDINES.

"C. Boutier et Cie." Oblong can, 4½ by 3½ by 1 inch. Eastport, Me. 54,913. Eagle Preserved Fish Company.

SARDINES.

"Boutier." Oblong can, 3 by 3 by 4½ inches. Eastport, Me. 54,911. Eagle Preserved Fish Company.

SARDINES IN OIL.

"Frère Maladin." Oblong can. Eastport, Me. 54,910. Eagle Preserved Fish Company.

SARDINES.

"Pilloux Frères." Oblong can, 4½ by 3½ by 1 inch. Eastport, Me. 54,914. Eagle Preserved Fish Company.

SARDINES.

"Alfonse Pallier Fils." Oblong can, 3 by 4½ by 1 inch. Eastport, Me. 54,912. Eagle Preserved Fish Company.

SARDINES.

"Usine Prévôt." Oblong can, 4¼ by 3 by 1 inch. Camden, Me. 54,946. Union Fish Company.

SARDINES.

"Alfonse Pallier Fils." Oblong can, 4½ by 3½ by 1½ inches. Eastport, Me. 54,916. Eagle Preserved Fish Company.

OIL SARDINES.

"Dubois," "Louis Philippe," and "Alfred Étienne" brands. Samples of ¼, ½, and 1/1 cans. Camden, Me. Office 323 Greenwich street, New York. Rosenstein Bros.

OIL SARDINES.

Samples of oblong cans. Eastport, Me. Wolff & Riesing.

FOR PRODUCTS CANNED DRY.

BONELESS HERRING.

Half dozen small tin boxes for packing smoked herring stripped of skin and bones. Boston, Mass. L. Pickert & Co.

KIPPERED HERRING.

One dozen 1-pound oval cans. Boston, Mass. A. H. Bailey & Co.

SMOKED HALIBUT.

One-pound flat cans. Boston, Mass. Potter & Wrightington.

SMOKED HALIBUT.

Oval can, 5 by $3\frac{3}{4}$ by $1\frac{3}{4}$ inches. Boston, Mass. 54,948. Potter & Wrightington.

PARAGON ENGLISH HERRING.

Smoked. Round can. Height, 5 inches; diameter, $1\frac{1}{2}$ inches. Boston, Mass. 54,928. Henry Mayo & Co.

BONELESS HERRING.

Oval can, 5 by $2\frac{1}{2}$ by $\frac{1}{2}$ inch. Boston, Mass. 54,929. Potter & Wrightington.

STAR BRAND BONELESS HERRING.

Oblong can, 6 by 4 by $2\frac{3}{8}$ inches. New York. 54,930. J. W. Beardsley's Sons.

TIGER BRAND BONELESS HERRING.

Oblong can, 6 by 4 by $2\frac{3}{8}$ inches. Boston, Mass. 54,931. Boston Packing Company.

FINNAN HADDIES.

One dozen 1-pound oval cans. Boston, Mass. A. H. Bailey & Co.

FINNAN HADDIES.

Half dozen 1-pound cans. Boston, Mass. L. Pickert & Co.

FINNAN HADDIES OR SMOKED HADDOCK.

One dozen 1-pound round cans. Portland, Me. Burnham & Morrill.

SMOKED SALMON.

Oval can, 5 by $3\frac{3}{4}$ by $1\frac{3}{4}$ inches. Boston, Mass. 54,949. Potter & Wrightington.

SMOKED SALMON.

One-pound flat and round cans. Boston, Mass. Potter & Wrightington.

BONELESS SMOKED SALMON.

Oval can, 5 by $3\frac{1}{2}$ by $6\frac{1}{4}$ inches. San Francisco, Cal. 54,950. Cutting Packing Company.

COMPRESSED COD.

Samples of tin box for packing salt codfish stripped of skin and bones. Boston, Mass. L. Pickert & Co.

SERIES OF PHOTOGRAPHS, 30 BY 40 INCHES AND 8 BY 10 INCHES, ILLUSTRATING THE PREPARATION OF CANNED PRODUCTS.

SARDINE CANNERY.

View of Wolff's cannery from the water. Eastport, Me., 1882. Photo. 1,889. U. S. Fish Commission.

SARDINE CANNERY.

Views of Green's cannery from opposite hill. Eastport, Me., 1882. Photos. 1,892–3. U. S. Fish Commission.

SARDINE INDUSTRY.

View of Martin's cannery. Eastport, Me., 1882. Photo. 1,928. U. S. Fish Commission.

UNLOADING SARDINES.

Hoisting in sardines at Wolff's factory from sloop Lulu. Eastport, Me., 1882. Photo. 1,883. U. S. Fish Commission.

SARDINE CANNERY.

Views of Green's wharf from an elevation looking toward the water. Flakes, workmen, fish, and baskets in background. Eastport, Me., 1882. Photos. 1,890 (*a*, *b*, *c*). U. S. Fish Commission.

WASHING SARDINES.

Green's wharf, looking toward the land. Washing fish in foreground. Eastport, Me., 1882. Photo. 1,891. U. S. Fish Commission.

DRESSING SARDINES.

Cutting off heads and tails from sardines preparatory to canning. Eastport, Me., 1882. Photos. 1,888 (*a*, *b*). U. S. Fish Commission.

SARDINE BASKETS.

Fish baskets filled with sardines for flakes. Eastport, Me., 1882. Photo. 1,882. U. S. Fish Commission.

DRYING SARDINES.

Flaking scene at factory of John Abrams. Nova Scotia girls at work. Eastport, Me., 1882. Photo. 1,887. U. S. Fish Commission.

SARDINE FLAKES.

Holmes's sardine cannery, showing flakes on roof for drying fish. Eastport, Me., 1882. Photo. 1,896. U. S. Fish Commission.

SARDINE CANNERY.

Flaking-room at Green's cannery, showing fish elevator. Eastport, Me., 1882. Photo. 1,895. U. S. Fish Commission.

FRYING SARDINES.

Frying sardines at Green's cannery, preparatory to canning. Eastport, Me., 1882. Photo. 1,929. U. S. Fish Commissison.

COOKING SARDINES.

Bathing-room at cannery of Eagle Preserved Fish Company, showing retorts and men venting cans. Eastport, Me., 1882. Photo. 1,879. U. S. Fish Commission.

CANNING SARDINES.

Sealing-room at cannery of Eagle Preserved Fish Company, showing men at work sealing cans. Eastport, Me., 1882. Photo. 1,880. U. S. Fish Commission.

SARDINE CANS.

Making sardine cans at cannery of Eagle Preserved Fish Company,, Eastport, Me., 1882. Photo. 1,881. U. S. Fish Commission.

CANNING SARDINES.

Packing-room of Eagle Preserved Fish Company's cannery, showing oven in the background. Eastport, Me., 1882. Photo. 1,878. U. S. Fish Commission.

CANNING SARDINES.

Packing-room at Eagle Preserved Fish Company's sardine cannery. Eastport, Me., 1882. Photo. 1,877. U. S. Fish Commission.

CANNING MACKEREL.

Filled cans in trays ready for hot bath, and girls cleaning cans at Potter & Wrightington's cannery. Boston, Mass., 1882. Photo. 1,813. U. S. Fish Commission.

CANNING MACKEREL.

Girls at work canning tomato-sauce to be used in preserving boiled mackerel. Potter & Wrightington's cannery. Boston, Mass., 1882. Photo. 1,814. U. S. Fish Commission.

CANNING MACKEREL.

Men at work making cans at Potter & Wrightington's cannery. Boston, Mass., 1882. Photo. 1,815. U. S. Fish Commission.

FISH-CLEANING MACHINE.

Revolving brushes for cleaning mackerel for canning at Charles A. Dyer & Co.'s establishment, with two boys at wheels. Portland, Me., 1882. Photo. 1,870. U. S. Fish Commission.

CANNING SALT MACKEREL.

Interior view of John Pew & Son's cannery, with men packing brine-salted mackerel in cans. Gloucester, Mass., 1882. Photo. 1,845. U. S. Fish Commission.

6. PRESERVATION BY BOILING.

BOILED LOBSTERS.

LOBSTER-BOILING FACTORY.

Model. This model shows the factory with its vats for steaming the lobsters, the wharf, and the derricks used in handling them. Boston, Mass. 26,583. Johnson & Young. The lobsters are boiled alive, and after turning red are considered cooked, and peddled through the streets. Large quantities are shelled and canned.

BOILING LOBSTERS.

Apparatus for lobster-boiling at A. L. Johnson's, Portland, Me., 1882. Photo. 1,872. U. S. Fish Commission.

7. ANTISEPTICS FOR PRESERVING FISH.

SALT.

PHOTOGRAPH.

Ship unloading salt with horses at Pew's wharf. Gloucester, Mass., 1882. Photo. 1,847. U. S. Fish Commission.

VARIETIES OF SALT USED IN PRESERVING FISH.

(1) Trapani salt, especially used for dry-salting codfish; Cadiz salt, especially used for dry-salting codfish; (2) Liverpool salt, especially used for pickling mackerel; (3) Syracuse (American) salt, sometimes used for curing fish. Gloucester, Mass. Collected by Capt. S. J. Martin.

II.—PREPARATION OF OILS, GUANO, AND GLUE.

8. WHALE-FISHERY PRODUCTS.

EXTRACTION OF WHALE OIL AND PREPARATION OF WHALEBONE.

(For list of apparatus exhibited to illustrate the preparation of these products see Section E, "Catalogue of Whale-fishery Appliances.")

PHOTOGRAPHS TO ILLUSTRATE THE REFINING AND STORAGE OF WHALE OIL.

WHALE-OIL REFINERY.

Bleaching room at refinery of George Delano & Co. New Bedford, Mass., 1882. Photo. 1824. U. S. Fish Commission. In this

WHALE-OIL REFINERY—Continued.

room the oil, previously chilled and pressed, is drained into shallow tanks and bleached by exposure to the sun, shining through large skylights.

STORAGE OF WHALE OIL.

View of wharf, with casks of oil partly covered with sea-weed to prevent leakage. New Bedford, Mass., 1882. Photo. 1,822 U. S. Fish Commission.

9. FISH OILS AND GUANO.

MENHADEN OIL AND GUANO.

MENHADEN OIL AND GUANO FACTORY.

Large model of factory of Joseph Church & Co. All the apparatus used in preparing oil and guano is shown in this model, the fish-pens, cooking-tanks, presses, oil-room, &c.; also, the boarding-house for the workmen, and the office of the superintendent. A Menhaden steamer is represented at the wharf in position to unload her cargo. Tiverton, R. I. U. S. Fish Commission.

GUANO MIXER.

Model. Patented April 27, 1867. Baltimore, Md. This mixer is employed in the fish-guano works for the purpose of thoroughly mixing the fish scrap with the mineral phosphates and sulphuric acid.

COD-LIVER OIL.

OIL-BAGS.

Stout cotton drilling; three loops around opening to attach it to bag-filler. Length, 16½ inches; width, 14 inches. Gloucester, Mass., 1883. 57,865. U. S. Fish Commission. Used in making cod-liver oil. These are filled with stearine or blubber and subjected to heavy pressure, which extracts the oil from the contents of the bags.

BAG-FILLER.

Tin; conical; opening at top, 14½ inches diameter; mouth, or lower opening, 8 inches diameter. Iron hooks around bottom to hang bags on, 12 inches deep. Projecting shelf attached to top to catch drippings. Width of shelf, 13 inches; length, 12 inches. Gloucester, Mass., 1883. 57,863. U. S. Fish Commission. Used for fillings bags with blubber and stearine.

WOODEN HORSE FOR BAG-FILLER.

Two feet high, 2 feet 3 inches long, 13 inches wide. Circular hole in top of horse for bag-filler. Gloucester, Mass., 1883. 57,864. U. S. Fish Commission. Used in the manufacture of cod-liver oil.

PRESS-BOARDS FOR COD-LIVER OIL.

Pine wood; square cuts 1½ inches deep at ends for press uprights. Two feet 6 inches long, 18 inches wide; made of two boards. Gloucester, Mass., 1883. 57,859. U. S. Fish Commission. Used for pressing oil. Bags filled with blubber or stearine are placed between these in alternate layers, first a board and then a bag. On top of all is a heavy press which squeezes out the oil.

OIL-SUCKER, OR BUNG-THIEF.

Tin cylinder, cone-shaped bottom; vent hole and handle at top. Length, 17 inches; diameter, 1½ inches. Gloucester, Mass., 1883. 57,866. U. S. Fish Commission. Used for transferring oil from one cask to another when the first has been filled too full.

OIL-DIPPER.

Tin. Used with long wooden handle. Capacity, one gallon. Gloucester, Mass., 1883. 57,808. U. S. Fish Commission. Used for dipping oil from kettles.

OIL-BAILER.

Tin dipper, with tin handle. Diameter of bowl, 9½ inches; depth, 4 inches; length of handle, 6 inches. Gloucester, Mass., 1883. 57,809. U. S. Fish Commission. Used for dipping oil.

OIL-SKIMMER.

Tin. Round handle of tin. Blade 8½ inches wide, handle 6½ inches long. Gloucester, Mass., 1883. 57,810 U. S. Fish Commission. Used for skimming oil.

SERIES OF PHOTOGRAPHS, 30 BY 40 INCHES, AND 8 BY 10 INCHES, ILLUSTRATING THE PREPARATION OF FISH OIL AND GUANO.

MENHADEN OIL FACTORY.

Views of Joseph Church & Co.'s menhaden factory. Tiverton, R. I., 1882. Photo. 1,981, south side of building. Photo. 1,981*a*, duplicate nearer view of south side. Photo. 1,982, west side of building. Photo. 1,982*a*, west side, more distant view. U. S. Fish Commission.

MENHADEN STEAMER UNLOADING.

View of menhaden steamer, Joseph Church, at wharf, just arrived with 500 barrels menhaden, caught off Delaware Breakwater. Photo. 1,990. View of deck, hatches off, showing hold full of fish. Photos. 1,991–4, general view, unloading the fish. Joseph Church & Co.'s factory. Tiverton, Rhode Island, 1882. U. S. Fish Commission.

RECEPTACLES FOR MENHADEN.

Fish-pens where the menhaden are received from steamer. Trough leading to cooking tank. Pens empty, capacity 5,000 barrels. Joseph Church & Co.'s factory. Tiverton, R. I., 1882. Photo. 1,987. U. S. Fish Commission.

UNLOADING CARGO OF MENHADEN.

Dumping menhaden in fish-pens at Joseph Church & Co.'s factory. Tiverton, R. I., 1882. Photo. 1,993. U. S. Fish Commission.

MENHADEN COOK-ROOM.

Cook-room with row of 23 tanks, total capacity 2,000 barrels. In these tanks the menhaden are boiled in salt water, the oil drained into the oil-room and the refuse or scrap pressed to remove the remaining oil. The scrap then goes to the scrap-room for drying. Joseph Church & Co.'s factory. Tiverton, R. I. Photo. 1,988. U. S. Fish Commission.

MENHADEN PRESS-ROOM.

Press-room with presses for removing oil from cooked menhaden. Joseph Church & Co.'s factory. Tiverton, R. I., 1882. Photo. 1,992. U. S. Fish Commission.

MENHADEN OIL-ROOM.

Oil-room; tanks holding a total of 800 gallons of oil. Factory of Joseph Church & Co. Tiverton, R. I., 1882. Photo. 1,995. U. S. Fish Commission.

MENHADEN GUANO-ROOM.

View of shipping-room at Joseph Church & Co.'s factory, showing 6,000 tons of menhaden scrap in piles and men bagging it for shipment. Tiverton, R. I., 1882. Photo. 1,984. U. S. Fish Commission.

MENHADEN OIL INDUSTRY.

View on wharf at Joseph Church & Co.'s menhaden factory, showing carboys of vitriol, used in the business. Tiverton, R. I., 1882. Photo. 1,983. U. S. Fish Commission.

WATER PUMP.

Steam pump for supplying cooking-tanks with salt water. Joseph Church & Co.'s factory. Tiverton, R. I., 1882. Photo. 1,986. U. S. Fish Commission.

ENGINE FOR UNLOADING VESSELS.

Hoisting-engine used in unloading cargoes of menhaden at Joseph Church & Co.'s factory; unloads 300 barrels per hour. Tiverton, R. I., 1882. Photo. 1,985. U. S. Fish Commission.

OIL-MAKING.

Oil-kettle, press, pomace, and salt-bin at Brown's factory. Lubec, Me., 1882. Photo. 1,921. U. S. Fish Commission.

10. FISH GLUE AND ISINGLASS.

PHOTOGRAPHS ILLUSTRATING THE MANUFACTURE OF GLUE AND ISINGLASS.

DRYING HAKE SOUNDS.

Flakes at wharf of Sylvanus Smith, with hake sounds spread out to dry. Gloucester, Mass., 1882. Photos. 2,027–8. U. S. Fish Commission. To be rolled into ribbon isinglass.

FISH-GLUE FACTORY.

Buildings of Russia Cement Company for the manufacture of liquid fish-glue from fish skins. Built, 1881. West Gloucester, Mass., 1882. Photo. 1,965. U. S. Fish Commission.

III.—WHARVES, MARKETS, AND TRANSPORTATION.

11. MODELS AND ILLUSTRATIONS.

FISH-WHARVES.

GLOUCESTER FISH-WHARF.

Model showing fish-wharf, with house for storing of salt and vessel tackle, sheds for storing fish, butts for pickling, flakes, weighing-scales, and other apparatus for handling and curing dry-salted and pickled fish. Gloucester, Mass. Made by Higgins & Gifford.

TRANSPORTATION CANS AND KEGS.*

OYSTER CANS.

Samples of tin pails and boxes used for the transportation of shelled oysters. Baltimore, Md. A. Booth.

OYSTER KEGS.

Wooden kegs, from one quart to several gallons capacity, used for transportation of shelled oysters. Baltimore, Md. A. Booth.

TUBS AND KEGS.

Made of wood and used for packing oysters and fish: 2-gallon oak oyster tub, 3-gallon oak oyster tub, 4-gallon oak oyster tub, 6-gallon oak oyster tub, 10-gallon oak oyster tub, 15-gallon oak oyster tub, $\frac{1}{4}$-gallon oyster keg, $\frac{1}{2}$-gallon oyster keg, 1-gallon oyster keg, 2-gallon oyster keg, 3-gallon oyster keg, 4-gallon

* See also Refrigerators.

TUBS AND KEGS—Continued.

oyster keg, 5-gallon oyster keg, ¼ anchovy keg, ½ anchovy keg, 1 anchovy keg, ¼ Russian sardine keg, ½ Russian sardine keg, 1 Russian sardine keg, 1 Russian sardine keg (white hoops), ⅛ sardelle keg, herring keg. New Haven, Conn. W. S. Robinson & Co.

OYSTER PAILS.

Assorted sizes of patent pail for transporting oysters. Chicago, Ill. Mann Brothers.

APPARATUS USED IN FISH MARKETS.

WEIGHING SCALES.

Used in fish markets, on wharves, or in scientific investigations:

1. Nickel-plated prescription scales in glass case; set of weights, 1-ounce troy to ¼ grain. Value $19.50.
2. Galvanized-iron fish scales; platform, with wheels, &c.; weighs 1,000 pounds. Value $57.50.
3. Union scale. Value $14.
4. Union 2-platform scale. Value $14.50.
5. Union "D. B." scale. Value $15.
6. Grocer "D. B." scale. Value $13.
7. Grocer square "P. P." scale. Value $12.50.
8. Counter scale. Value $10.
9. Tea scale. Value $8.
10. Two-trip "B. S." and 2 "I. P." scale. Value $9.
11. One-trip "P. I. P.," and "Bm." scale. Value $12.50.
12. One-trip square "P." and "I. P." scale. Value $11.
13. Boston market scale, "S. P." copper-pan, with set of brass weights. Value $30.
14. Brass beam and brass poiser, 400 pounds. Value $44.

New York. Fairbanks & Co., manufacturers, 311 Broadway.

FISH-SCALER.

Rubber currycomb, with brass tips. Boston, Mass., 1882. 54,485. U. S. Fish Commission. Used in fish markets for removing scales from fish.

FISH-SCALER.

Iron plate, with short projecting points, for scraping off fish scales. Open handle. Length, 9 inches. Boston, Mass., 1882. 54,486. U. S. Fish Commission. Not so much used as the currycomb.

FISH-SCALING KNIFE.

Steel blade, with saw-like teeth on cutting edge. Hard-wood handle. Length: blade, 6 inches; handle, 4½ inches. Centennial col-

FISH-SCALING KNIFE—Continued.

lection, 1876. 26,210. Made by John Russell Cutlery Co., Turner's Falls, Mass. Used in fish markets for removing scales from fish.

SERIES OF PHOTOGRAPHS, 30 BY 40 INCHES AND 8 BY 10 INCHES, ILLUSTRATING FISH MARKETS, WHARVES, AND TRANSPORTATION APPLIANCES.

FRESH-FISH MARKET.

General view of commercial wharf, with fleet of vessels unloading their catch, peddlers purchasing fish, &c. Boston, Mass., 1882. Photo. 1,805. U. S. Fish Commission. Commercial wharf is the headquarters in New England of the fresh-fish business. The fish are here packed in ice and shipped to all parts of the country.

SALT-FISH MARKET.

View of western side of Snow's wharf, with vessels unloading dry and pickled fish. Piles of fish and barrels on the wharf. Boston, Mass., 1882. Photo. 1,812. U. S. Fish Commission.

FRESH-FISH MARKET.

Sale tables at retail fish stand of E. G. Blackford. New York, 1882. Photos. 2,114–7. U. S. Fish Commission.

FRESH-FISH MARKET.

Interior of E. G. Blackford's office at his retail fish stand in Fulton Market. New York, 1882. Photo. 2,123. U. S. Fish Commission.

CARTING CODFISH.

Jigger loaded with dry-salted cod. Gloucester, Mass., 1882. Photo. 2,102. U. S. Fish Commission.

PACKING SALT COD FOR EXPORT.

View of interior of buildings of Franklin Snow & Co., with men engaged in packing dry-salted cod in drums for exportation to West Indies. Boston, Mass., 1882. Photo. 1,811. U. S. Fish Commission.

DRY-FISH MARKET.

Shipping-room for dry-salted fish at Franklin Snow & Co.'s buildings. Boston, Mass., 1882. Photo. 1,817. U. S. Fish Commission.

CARTING MACKEREL.

Jigger loaded with barrels of brine-salted mackerel. Gloucester, Mass., 1882. U. S. Fish Commission.

FRESH-FISH MARKET.

Street-front view of Fulton wholesale fish market. New York, 1882. Photo. 2,113. U. S. Fish Commission.

FRESH-FISH MARKET.

Interior view of Fulton wholesale fish market. New York, 1882. Photo. 2,118. U. S. Fish Commission.

FRESH-FISH MARKET.

Water-front view of Fulton wholesale fish market, with live-cars and vessels in foreground. New York, 1882. Photo. 2,124. U. S. Fish Commission.

FISH CART.

Two-wheeled hand-cart used by fish peddlers in New England towns. Boston, Mass., 1882. Photo. 1,803. U. S. Fish Commission.

LOADING DRY FISH.

Vessel at Trefethen's wharf loading the dry fish for market. Portland, Me., 1882. Photo. 1,861. U. S. Fish Commission.

FISH MARKET.

View of dock and fish cars. Detroit, Mich., 1882. Photo. 2,205. U. S. Fish Commission.

FISH WHARF.

View of Perkins's wharf, with men at work packing dry and pickled fish and wagons loading with boxes and barrels of fish. Gloucester, Mass., 1882. Photo. 2,109. U. S. Fish Commission.

IV.—PATENTS RELATING TO FISHERY PRODUCTS.

12 SPECIFICATIONS AND DRAWINGS; ISSUED FROM 1834 TO 1883.

(Issued by the United States prior to January 1, 1883. In three volumes. The third volume contains nearly three hundred patents relating to the preparation and preservation of fish and products, classified as follows:)

"1. Food compounds: Extract of clams, extract of oysters, fish and potatoes, manufacture of caviare.

"2. Implements for preparing: Clam-openers, eel-skinners, fish-boners, fish-cutters, fish-drainers, fish-dressers, fish-flakers, fish-scalers, mackerel-splitters, oyster-blocks, oyster-knives, oyster-nippers, oyster-openers, oyster-shuckers.

"3. Miscellaneous products. Artificial stone, buttons, cement, clearing coffee, coating sponge, compositions, cuttle-fish holders, dressing leather, dyeing, lime, mattresses, mounting pearl, preparation of whalebone, refining varnish, shells, taxidermy, treating cordage, treating fibers, varnish for cans, whalebone for hats.

"4. Preserving apparatus. Boxes, bundles, cans, can fillers, coolers, dessicating, driers, flakes, freezing, houses, jars, pans, packing, pickling, presses, refrigerators, safes, sealing cans, steamers, smoke-houses.

"5. Preserving processes. Condensing, compositions, desiccating, pickling, salting, smoking.

"6. Fertilizers. Apparatus, clam shells, compositions, driers, fish guano, grinding, lobsters, marl-oyster shells, presses, tanks.

"7. Isinglass and glue. Glue, gelatine, isinglass, preparation.

"8. Oils. Cleansing, drying, extracting, mincing whale-blubber, presses, purifying, refining, rendering, separating, treating."

C.—ANIMAL PRODUCTS AND THEIR APPLICATION.

V.—FISHERY PRODUCTS USED FOR FOOD.

13. Foods in a fresh condition.

(This section includes specimens of marketable fishes in a fresh condition, in refrigerators, forwarded from time to time by E. G. Blackford, Fulton Market, New York.)

14. Foods: dried and smoked.

PLAIN DRIED AND DRY-SALTED PREPARATIONS.

(See also Preparations in cans; canned dry.)

George's codfish.

Dry-salted cod (*Gadus morrhua*) from George's fishing bank. Packed in 100-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

Western Bank codfish.

Dry-salted cod (*Gadus morrhua*) from Western Bank and Banquereau fishing grounds. Packed in 100-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

Grand Bank codfish.

Dry-salted cod (*Gadus morrhua*) from Grand Bank fishing grounds. Packed in 100-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

Haddock.

Dry-salted haddock (*Melanogrammus æglefinus*). Packed in 100-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

Hake.

Dry-salted hake (*Phycis chuss*). Packed in 100-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

Cusk.

Dry-salted cusk (*Brosmius brosme*). Packed in 100-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

POLLOCK.

Dry-salted pollock (*Pollachius carbonarius*). Packed in 100-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

DRESSED COD.

Dry-salted cod (*Gadus morrhua*), stripped of skin and bones, and packed whole in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

BONELESS COD.

Selected George's Bank dry-salted cod (*Gadus morrhua*), stripped of skin and bones, and cut into pieces about one foot long. Packed in 5-pound and 40-pound wooden boxes. Gloucester, Mass. U. S. Fish Commission.

COMPRESSED BONELESS COD.

Dry-salted cod (*Gadus morrhua*), stripped of skin and bones, cut into pieces 4 inches wide, and pressed, cut-edge up, in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

ROLY-POLY BONELESS COD.

Dry-salted cod (*Gadus morrhua*), stripped of skin and bones, tied into rolls, and cut into lengths of 4½ inches. Packed in 40-pound wooden boxes. Gloucester, Mass.

DRESSED HAKE.

Dry-salted hake (*Phycis chuss*), stripped of skin and bones, and packed whole in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

BONELESS HAKE.

Dry-salted hake (*Phycis chuss*), stripped of skin and bones, and cut into 12-inch lengths. Packed in 40-pound wooden box.

COMPRESSED BONELESS HAKE.

Dry-salted hake (*Phycis chuss*), stripped of skin and bones, and cut into 4½-inch lengths. Packed, cut-edge up, in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

ROLY-POLY BONELESS HAKE.

Dry-salted hake (*Phycis chuss*), stripped of skin and bones, rolled lengthwise, and tied and cut into bundles 4½ inches long. Packed, cut-edge up, in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

DRESSED HADDOCK.

Dry-salted haddock (*Melanogrammus æglefinus*), stripped of skin and bones, and packed whole in 40-pound wooden boxes.

BONELESS HADDOCK.

Dry-salted haddock (*Melanogrammus æglefinus*), stripped of skin and bones, and cut into 12-inch lengths. Packed in 40-pound wooden boxes. Gloucester, Mass. U. S. Fish Commission.

COMPRESSED BONELESS HADDOCK.

Dry-salted haddock (*Melanogrammus æglefinus*), stripped of skin and bones, cut into 4½-inch lengths; packed, cut-edge up, in 40-pound box. Gloucester, Mass. U. S. Fish Commission.

ROLY-POLY BONELESS HADDOCK.

Dry-salted haddock (*Melanogrammus æglefinus*), stripped of skin and bones, rolled lengthwise, and tied into bundles and cut into 4½-inch lengths; packed, cut-edge up, in 40-pound wooden boxes.

DRESSED CUSK.

Dry-salted cusk (*Brosmius brosme*), stripped of skin and bones, and packed whole in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

BONELESS CUSK.

Dry salted cusk (*Brosmius brosme*), stripped of skin and bones, cut into 12-inch lengths, and packed in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

COMPRESSED BONELESS CUSK.

Dry-salted cusk (*Brosmius brosme*), stripped of skin and bones, and cut into 4½-inch lengths. Packed, cut-edge up, in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

ROLY-POLY BONELESS CUSK.

Dry-salted cusk (*Brosmius brosme*), stripped of skin and bones, rolled lengthwise and tied, and cut into bundles 4½ inches long; packed, cut-edge up, in 40-pound wooden box. Gloucester, Mass. U. S. Fish Commission.

BONELESS COD.

One box of compressed cod (*Gadus morrhua*), 10 packages in case, 5 pounds each, with all large bones removed, compressed in rolls of a round shape, and ready for cooking. Portland, Me. Perkins & Shurtleff.

BEARDSLEY'S SHREDDED CODFISH.

Dry-salted cod (*Gadus morrhua*), stripped of skin and bones, shredded or torn into a fibrous mass, and packed in 1-pound boxes. New York. J. W. Beardsley's Sons, 179 West street.

BONELESS CODFISH, BEEHIVE BRAND.

Dry-salted cod (*Gadus morrhua*), stripped of skin and bones, cut into pieces, and put up in packages of 1 pound each, rolled in waxed paper. New York. J. W. Beardsley's Sons, 179 West street.

BONELESS CODFISH.

Dry salted cod (*Gadus morrhua*), stripped of skin and bones, cut in pieces, and packed in 5-pound wooden boxes, with glass covers. Boston, Mass. B. S. Snow & Co.

ALDEN'S PREPARED FOODS.

(Fresh codfish are cleaned, stripped of skin and bones, and exposed to heat in a large circular pan, when the flesh is reduced to a dry fibrous mass, but still retaining its nutrient properties. It is easily and quickly prepared for cooking by soaking a few moments in water.)

1. Dried fresh codfish in one-quarter and one-half pound paper packages.
2. Dried fresh haddock, in one-quarter and one-half pound paper packages.
3. Codfish cakes, fresh fish, and potatoes, in one-quarter and one-half pound paper packages.
4. Dried fresh clams, in one-half pound paper packages.
5. Dried fresh oysters, in one-quarter pound paper packages.
6. Mince-meat, beef, beef-hash, carrots, potatoes, and beets, in one-quarter and one half pound paper packages.

Randolph, Mass., and New York. Charles Alden.

DRIED HALIBUT.

Shooyoult. Indian food-fish. Northwest coast of America. 55,39 . Collected by James G. Swan.

DRIED FALL SALMON.

Chuch-kowis. Indian foodfish. Northwest coast of America. 55,395. Collected by James G. Swan.

DRIED SALMON.

Eskimo food. Eschscholtz Bay, Alaska. 46,469. Collected by E. P. Herendeen.

DRIED TROUT.

The flesh of trout (*Salmo* sp.) prepared and used for food by the Ahgy Pai-Ute Indians. Walker Lake, Nevada. 19,646. Collected by Stephen Powers.

OULACHON OR CANDLE-FISH (*Thaleichthys pacificus*).

Dried for food by the Indians. Washington Territory. 30,255. Collected by James G. Swan.

SHOW.

Pronounced to rhyme with how. Chiton. Indian food-fish. Northwest coast of America. 65,397. Collected by James G. Swan.

BADOWITS.

Smelts. Indian food-fish. Northwest coast of America. 59,393. Collected by James G. Swan.

DRIED FISH.

Varieties of fish prepared and used for food by the Chinese of the the Pacific coast, California. 55,399, 56,401–5. Collected by Prof. David S. Jordan.

DRIED SALMON-EGGS.

The eggs of the quinnat salmon (*Oncorhynchus chouicha*). Prepared for food by McCloud River Indians. Shasta County, California. 11,049. Collected by Livingston Stone.

DRIED HERRING-EGGS.

Indian name, Haterbok. Prepared for food by Indians of Pacific coast. Washington Territory. 55,392. Collected by J. G. Swan.

HERRING EGGS.

The eggs of herring. (*Clupea mirabilis.*) Used as food by Sitka Indians. Collected by them upon branches of hemlock (*Abies merten siana*), placed in shallow water, upon the spawning grounds of the fish. Sitka, Alaska. 21,187. Collected by J. G. Swan.

FISH MEAL.

Flour or meal made from dried flesh of quinnat salmon (*Oncorhynchus chouicha*), by the McCloud River Indians. Shasta County California. 21,716. Collected by Livingston Stone.

DRIED SALMON-EGGS.

The eggs of quinnat salmon (*Oncorhynchus chouicha*), prepared for food by the Bannock Indians. Montana Territory. 11,049. Deposited by Army Medical Museum.

CHY.

A small frog (*Engystoma*). Food of the Nishimans Indians, Bear River. Placer County, California. 21,430. Collected by S. Powers. Roasted in the ashes and eaten.

DRIED ABALONES.

Used as food by the Indians on Southern coast of California, and exported to China, as food, in large quantities. Santa Barbara, California. 32,795. Collected by Prof. David S. Jordan.

WHALE SINEW.

The sinews of the California gray whale and other species, dried and used for food by the Chinese on the Pacific coast. San Francisco, California. 39,473. Collected by Prof. D. S. Jordan.

DRIED PORPOISE MEAT.

Used by the Passamaquoddy Indians. Eastport, Me. 11,436. Collected by Dr. E. Palmer.

DRIED SEAL MEAT.

Used by the Passamaquoddy Indians. Eastport, Me. 11,135. Collected by Dr. E. Palmer.

PRAWNS.

Dried. Used by the Chinese of California. Collected by Prof. David S. Jordan. 55,408.

PRAWNS.

In shell. Used by the Chinese of California. Collected by Prof. David S. Jordan. 55,407.

DRIED PRAWNS.

On bamboo sticks. Used by the Chinese of California. Collected by Prof. David S. Jordan. 55,410.

SHRIMPS.

Dried. Used by the Chinese of California. Collected by Prof. David S. Jordan. 55,409.

SHRIMPS.

In shell, dried and pounded. Used by the Chinese of California. Collected by Prof. David S. Jordan. 55,413.

EDIBLE WORMS (Ingattun).

Varieties of worms (*Ephydra* sp.). Eaten raw, boiled, or dried. Found in Owen's Lake. Pinta Indians of Owen's River Valley. 19,713. Collected by Stephen Powers.

EDIBLE WORMS (Pishawattuh).

Varieties of worms (*Ephydra* sp.) used in soups. Pinta Indians. Owen's River Valley. 19,714. Collected by Stephen Powers.

DRIED SNAILS (Nowh).

Varieties of snails (*Helix columbiana* and *H. Vancouverensis*) roasted in the ashes or boiled in a basket with hot stones. Indians of Bear River, Placer County, California. 21,424–5. Collected by Stephen Powers.

MINNOWS.

It is pretended by the Indian doctor that this fish is a cure for diseases. After sucking the affected part a long time he vomits up one of these small fish and assures the patient that he will now recover. Indians of Bear River, Placer County, California. 21,423. Collected by Stephen Powers.

DRIED CLAMS (Cheetuk).

Prepared as food by the Indians of Northwest coast. Washington Territory. 55,396. Collected by J. G. Swan.

DRIED CUTTLE-FISH.

Prepared as food by the Chinese. California, 1880. 55,400. Collected by Prof. D. S. Jordan.

PRESSED SEA-WEED (*Porphyra vulgaris*).

Used as food by the Indians. Sitka, Alaska. 21,164. Collected by James G. Swan.

SMOKED PREPARATIONS.

(See also Canned smoked products.)

SMOKED SALMON.

The flesh of quinnat salmon (*Oncorhynchus chouicha*), prepared by the McCloud River Indians. Shasta County, California. 11,608. Collected by Livingston Stone.

SMOKED STURGEON.

The flesh of Lake Erie sturgeon (*Acipenser rubicundus*) as prepared for Western markets. Sandusky, Ohio. 12,122. Schacht & Brothers.

SMOKED HALIBUT.

The flesh of halibut (*Hippoglossus vulgaris*) cut into flitches, salted and smoked. Gloucester, Mass. U. S. Fish Commission. These fish are taken off the Greenland coast and on the Grand Bank; are flitched on the vessel and smoked in Gloucester. Packed in boxes of 40 pounds each.

SMOKED HALIBUT.

The flesh of halibut (*Hippoglossus vulgaris*) salted, cut into strips and rolled into one-pound packages, covered with thin paper, and smoked. Gloucester, Mass. U. S. Fish Commission. Packed in 5-pound boxes.

SMOKED HALIBUT.

Flesh of halibut (*Hippoglossus vulgaris*) salted, smoked, and cut into small pieces; packed in tin cans. Boston, Mass. Potter & Wrightington.

BONELESS HERRING.

Common sea-herring (*Clupea harengus*) salted and smoked and stripped of skin and bones. Packed in small wooden and tin boxes. Boston, Mass. U. S. Fish Commission.

BONELESS HERRING.

Star brand, common sea-herring (*Clupea harengus*), salted and smoked and stripped of skin and bones; packed in small wooden and tin boxes. New York. J. W. Beardsley's Sons, 179 West street.

BONELESS HERRING.

Blackwood's Mount Desert brand. Smoked herring (*Clupea harengus*) stripped of skin and bones. Half-dozen small wooden boxes. Boston, Mass. L. Pickert & Co.

SMOKED HERRING.

Common sea-herring (*Clupea harengus*) salted and smoked. Packed in wooden boxes. Branded as follows: (1) Lengthwise, (2) tucks, (3) number 1, (4) number 2, (5) scaled. Eastport, Me. S. B. Hume.

SMOKED WHITEFISH.

Lake whitefish (*Coregonus clupeiformis*), salted and smoked, for Western markets. Sandusky, Ohio. 12,121. Schacht & Brothers.

15. FOOD PRESERVED BY BRINE-SALTING.

(See also Canned products.)

MULLET.

Southern mullet (*Mugil albula*), brine-salted. Packed in wooden kits. Wilmington, N. C. Hall & Pearsall.

MACKEREL.

Prize mess, lion and unicorn mess, and other brands of brine-salted mackerel put up in cans. (See canned goods.)

16. FOOD PRESERVED IN CANS.

PLAIN BOILED.

FRESH COD (*Gadus morrhua*).

Two cases, each four dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

FRESH HERRING (*Clupea harengus*).

Two cases, each four dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

FRESH "OCEAN TROUT" OR SEA-HERRING (*Clupea harengus*).

Two cases, each four dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

"BROOK-TROUT" OR SEA-HERRING (*Clupea harengus*).

Half dozen 3-pound cans. Boston, Mass. L. Pickert & Co.

FRESH MACKEREL (*Scomber scombrus*).

In 1-pound and 2-pound cans. Boston, Mass. Henry Mayo & Co.

FRESH MACKEREL (*Scomber scombrus*).

Two cases, each 4 dozen 1-pound and 2-pound cans. Boston, Mass. Potter & Wrightington.

FRESH MACKEREL (*Scomber scombrus*).

Three samples 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

FRESH MACKEREL (*Scomber scombrus*).

One dozen 1-pound round cans. Portland, Me. Burnham & Morrill.

FRESH MACKEREL (*Scomber scombrus*).

In 1-pound and 2-pound cans. Boston, Mass. W. K. Lewis & Bros.

FRESH BLUEFISH (*Pomatomus saltatrix*).

Three 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

FRESH SEA-BASS (*Centropristis atrarius*).

Three 1-pound cans. Boston, Mass. A. H. Bailey & Co.

FRESH SMELTS (*Osmerus mordax*).

Half dozen 2-pound cans. Boston, Mass. L. Pickert & Co.

CANNED HALIBUT.

Fillet of halibut (*Hippoglossus vulgaris*) à la Italienne. In oval cans. New York. Hine & Co., 13 and 15 Doyer's street.

FRESH "ALBANY BEEF" OR STURGEON (*Acipenser* sp.).

Two dozen 1-pound and one dozen 2-pound cans. New York. Max Ams, 372 and 374 Greenwich street. "After long and constant experiments to preserve the meat of the sturgeon fish I have at last succeeded, and present to the trade a new article, of a fine taste, and being cheaper than salmon and lobster, will doubtless take its place as a strong competitor in the favor of the public." (*Max Ams.*)

FRESH "ALBANY BEEF" OR STURGEON (*Acipenser* sp.).

Four cases, containing 192 1-pound and 2-pound round cans. New York. Albany Beef Packing Company, 372 Greenwich street. "This article has its name from the fact that it was first brought into the market at the city of Albany, New York, and is the meat of sturgeon. Since a number of years it has been tried to preserve and put it up in some way to make it an article of merchandise, but not until recently has the attempt been rewarded with success, and will without doubt find in this shape a ready market. Being of a fine taste and flavor, cheaper than salmon or lobster, it can be put up in large quantities, and will in the near future prove a very desirable addition derived from the waters of the deep. Patent has been applied for." (*Richard Weinacht*, secretary.)

CANNED SALMON.

"Salmon à la Chambord." In oval cans. New York. Hine & Co., 13 and 15 Doyers street.

FRESH SALMON (*Oncorhynchus chouicha*).

Oval brand. Two cases of 1-pound cans. Chicago, Ill. Canneries at Astoria, Oregon. A. Booth.

FRESH SALMON (*Oncorhynchus chouicha*).

Oval brand. Two cases of 2-pound cans. Chicago, Ill. Canneries at Astoria, Oregon. A. Booth.

FRESH SALMON (*Oncorhynchus chouicha*).

Oval brand. Two cases 2-pound and 2½-pound cans. Chicago, Ill. Canneries at Astoria, Oregon. A. Booth.

FRESH SALMON (*Oncorhynchus chouicha*).

Two whole fish in fish-shaped cans. Chicago, Ill. Canneries at Astoria, Oregon. A. Booth.

FRESH SALMON (*Oncorhynchus chouicha*).

Six 1-pound cans of Columbia River salmon. Portland, Oregon. 57,137. Oregon Packing Company. J. W. & V. Cook, proprietors.

FRESH SALMON (*Oncorhynchus chouicha*).

Stag brand. Two cases, each four dozen 1-pound cans. Brookfield, Washington Territory. J. G. Megler & Co.

FRESH SALMON (*Oncorhynchus chouicha*).

Saint George brand. One case, two dozen 2½-pound cans. Brookfield, Washington Territory. J. G. Megler & Co.

FRESH SALMON (*Oncorhynchus chouicha*).

Saint George brand. Two cases, each four dozen 1-pound cans. Brookfield, Washington Territory. J. G. Megler & Co.

FRESH SALMON.

Five cases canned salmon (*Oncorhynchus* sp.). From California, Oregon, and Alaska streams. Five dozen large and small cans. San Francisco, Cal.; Astoria, Oreg.; Kusiloff River, Alaska. Cutting Packing Company. "This exhibit contains Alaska salmon, probably the first ever shipped abroad. One can contains one fish—live weight 86 pounds, dressed 65 pounds—the largest on record on this coast; caught at the company's cannery at the mouth of the Kusiloff River, Alaska, July 22, 1882. We began prospecting for runs for canning purposes in 1881, and, being located as above, found three varieties, called by us, for commercial purposes, 'King Fish,' 'Silver Side Salmon,' and 'Small Red Fish,' all of which are fully equal to the varieties caught by us at our canneries in Oregon and California." (*A. D. Cutler*, of Cutting Packing Company.)

FRESH DEEP-SEA SALMON (*Salmo salar*).

Three samples in 1-pound round cans. Boston, Mass. A. H. Bailey & Co.

FRESH LOBSTERS (*Homarus americanus*).

Three cases, six dozen 1-pound cans. Portland, Me. Portland Packing Company.

FRESH LOBSTERS (*Homarus americanus*).

Royal brand; one dozen 1-pound cans. Eastport Packing Company. Rosenstein Brothers, 323 Greenwich street, New York.

FRESH LOBSTERS (*Homarus americanus*).

Half dozen 1-pound cans. Boston, Mass. L. Pickert & Co.

FRESH LOBSTERS (*Homarus americanus*).

In 1-pound and 2-pound cans. Boston, Mass. W. K. Lewis & Brothers.

FRESH LOBSTERS (*Homarus americanus*).

One dozen 1-pound tall cans. Portland, Me. Burnham & Morrill.

FRESH LOBSTERS (*Homarus americanus*).

"Homards de La Reine." One dozen 1-pound flat cans. Portland, Me. Burnham & Morrill.

FRESH LOBSTERS (*Homarus americanus*).

Two cases, each four dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

FRESH LOBSTERS (*Homarus americanus*).

In 1-pound cans. Boston, Mass. Henry Mayo & Co.

FRESH CLAMS (*Mya arenaria*).

Half dozen 1-pound cans. Boston, Mass. L. Pickert & Co.

FRESH CLAMS (*Mya arenaria*).

In 1-pound and 2-pound cans. Boston, Mass. W. K. Lewis & Brothers.

FRESH CLAMS (*Mya arenaria*).

One dozen 1-pound round cans. Portland, Me. Burnham & Morrill.

FRESH CLAMS (*Mya arenaria*).

Two cases, each two dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

FRESH CLAMS (*Mya arenaria*).

In 1-pound and 2-pound cans. Boston, Mass. Henry Mayo & Co.

SCALLOPED OYSTERS.

In oval cans. New York. Hine & Co., 13 and 15 Doyers street.

LUNCH OYSTERS.

Oval brand. Three cases, twelve dozen cans. Baltimore, Md. A. Booth.

COVE OYSTERS.

Oval brand. Three cases, six dozen 1-pound cans. Baltimore, Md. A. Booth.

COVE OYSTERS.

Oval brand. Three cases, six dozen 2-pound cans. Baltimore, Md. A. Booth.

EXTRA COVE OYSTERS (*Ostrea virginica*).

Hampton Roads brand. Two cases of No. 1 and No. 2 cans. Hampton, Va. McMenamin & Co.

LUNCH OYSTERS (*Ostrea virginica*).

Two cases of flat cans. Hampton, Va. McMenamin & Co.

EXTRA SELECTED OYSTERS (*Ostrea virginica*).

Lion brand. Two cases of No. 1 and No. 2 cans. Hampton, Va. McMenamin & Co.

FRESH CRAB MEAT.

The meats of crabs (*Callinectes hastatus*). Two cases of No. 1 and No. 2 cans. Hampton, Va. McMenamin & Co.

FRESH GREEN TURTLE (*Chelonia mydas*).

Put up in 1-pound cans. New York. 26,751. Alden Sea-Food Company. Collected by E. G. Blackford, 1876.

GREEN TURTLE.

Filet of green turtle (*Chelonia mydas*), purée of mushrooms. In oval cans. New York. Hine & Co.

BOILED WITH VEGETABLES.

GREEN-TURTLE SOUP.

Prepared from green turtle (*Chelonia mydas*). In oval cans. New York. Hine & Co., 13 and 15 Doyers street.

GREEN-TURTLE STEW.

Prepared from green turtle (*Chelonia mydas*). In oval cans. New York. Hine & Co., 13 and 15 Doyers street.

TERRAPIN SOUP.

Prepared from diamond-back terrapin (*Malacoclemmys palustris*). In oval cans. New York. Hine & Co., 13 and 15 Doyers street.

TERRAPIN STEW.

Prepared from diamond-back terrapin (*Malacoclemmys palustris*). In oval cans. New York. Hine & Co., 13 and 15 Doyers street.

FISH CHOWDER.

Prepared from cod (*Gadus morrhua*), potatoes, &c. In 3-pound cans. Boston, Mass. Henry Mayo & Co.

FISH CHOWDER.

Prepared from fresh cod or haddock and potatoes. In 3-pound cans. Boston, Mass. W. K. Lewis & Brothers.

CLAM CHOWDER.

Soup made from clams (*Mya arenaria*), potatoes, &c. In 3-pound cans. Boston, Mass. Henry Mayo & Co.

CLAM CHOWDER.

Soup prepared from clams (*Mya arenaria*), potatoes, &c. Two cases, each two dozen 2-pound cans, and two cases, two dozen 3-pound cans. Boston, Mass. Potter & Wrightington.

CLAM CHOWDER.

Prepared from clams (*Mya arenaria*) and potatoes. In 3-pound cans. Boston, Mass. W. K. Lewis & Brothers.

CLAM CHOWDER.

Soup prepared from clams (*Mya arenaria*), potatoes, &c. Half-dozen 3-pound cans. Boston, Mass. L. Pickert & Co.

CODFISH BALLS.

Prepared from cod (*Gadus morrhua*), potatoes, &c. In 2-pound cans. Boston, Mass. Henry Mayo & Co.

CANNED IN BRINE, WITH HEAT.

AMERICAN CAVIARE.

Prepared from roe of sturgeon (*Acipenser* sp.). One case, in ½-pound and 1-pound cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

RUSSIAN CAVIARE.

Prepared from roe of sturgeon (*Acipenser* sp.). Two dozen 1-pound cans; one dozen 2-pound cans; one dozen ¼-kilogram cans; one dozen ½-kilogram cans. New York. Max Ams, 372 and 374 Greenwich street. "Caviare in gilt-varnished cans is of medium-sized fish-roe, and in taste and appearance like the caviare procured in Germany and the Netherlands. Caviare in red cans (*caviare russe*) is from sturgeon caught in the Lakes Erie, Ontario, Superior, and Michigan, is of an excellent taste and very large, and in every respect equal to Russian caviare. The canning process used in putting up this caviare was patented November 9, 1875, and by it this caviare can be guaranteed to keep in any climate or season." (*Max Ams.*)

CANNED IN BRINE, WITHOUT HEAT.

MESS MACKEREL.

Lion and Unicorn brand. Brine-salted mackerel (*Scomber scombrus*); split; heads and tails removed. Two cases, each one dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

PRIZE MESS MACKEREL.

Brine-salted mackerel (*Scomber scombrus*); split; heads and tails removed. Two cases, each one dozen 5-pound cans. Boston, Mass. Potter & Wrightington.

MINOT'S LIGHT BREAKFAST MESS MACKEREL.

Brine-salted mackerel (*Scomber scombrus*); split; heads and tails removed. Two cases, each one dozen 5-pound cans. Boston, Mass. Potter & Wrightington.

CANNED IN SPICES, MUSTARD SEED, MUSTARD SAUCE, TOMATO SAUCE, MARINATED, &c.

SPICED "SARDINES."

Royal brand. Small sea-herring (*Clupea harengus*) preserved in spices. Camden, Me.; office, 323 Greenwich street, New York. Rosenstein Brothers.

MUSTARD "SARDINES."

Small sea-herring (*Clupea harengus*) in mustard seed. One dozen half-cans and one dozen quarter-cans. Camden, Me.; office, 323 Greenwich street, New York. Rosenstein Brothers.

MUSTARD "SARDINES."

Small herring (*Clupea harengus*) preserved in mustard seed. One dozen quarter-cans. Eastport, Me. Wolff & Riesing.

"OCEAN TROUT."

Sea-herring (*Clupea harengus*) in mustard sauce. In 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

MACKEREL (*Scomber scombrus*).

In mustard sauce. In 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

MACKEREL (*Scomber scombrus*).

In mustard sauce. In 2-pound and 3-pound cans. Boston, Mass. Henry Mayo & Co.

FRESH MACKEREL (*Scomber scombrus*).

In tomato sauce. In 2-pound and 3-pound cans. Boston, Mass. Henry Mayo & Co.

MACKEREL (*Scomber scombrus*).

In tomato sauce. In 2-pound oval cans. Boston, Mass. A. H. Bailey & Co.

"OCEAN TROUT," OR SEA-HERRING (*Clupea harengus*).

In tomato sauce. In 4-pound oval cans. Boston, Mass. A. H. Bailey & Co.

"OCEAN TROUT," OR SEA-HERRING (*Clupea harengus*).

In tomato sauce. One case, four dozen square cans. Boston, Mass. Potter & Wrightington.

"OCEAN TROUT," OR SEA-HERRING (*Clupea harengus*).

In tomato sauce. One case, one dozen 3-pound cans. Boston, Mass. Potter & Wrightington.

FRESH HERRING (*Clupea harengus*).

In tomato sauce. One case, one dozen 3-pound cans. Boston, Mass. Potter & Wrightington.

FRESH SEA-BASS (*Centropristis atrarius*).

In tomato sauce. Two cases, each two dozen 2-pound cans. Boston, Mass. Potter & Wrightington.

AMERICAN EELS (*Anguilla rostrata*).

In jelly. Two dozen 1-pound round cans; one dozen 2-pound cans. New York. Max Ams, 372 and 374 Greenwich Street. "This article has in a very short time acquired the fame as being a favorite in every household, and the daily increasing demand for it shows clearly that it is everywhere appreciated as a splendid relish for the table." (*Max Ams.*)

MARINÉE "SARDINES."

Small herring (*Clupea harengus*) preserved in spices. One dozen quarter-cans. Eastport, Me. Wolff & Riesing.

SOUSED MACKEREL (*Scomber scombrus*).

Half dozen 1-pound and 3-pound cans. Boston, Mass. L. Pickert & Co.

SOUSED "OCEAN TROUT," OR SEA-HERRING (*Clupea harengus*).

One case, one dozen 3-pound cans. Boston, Mass. Potter & Wrightington.

SOUSED HERRING (*Clupea harengus*).

One case, one dozen 3-pound cans. Boston, Mass. Potter & Wrightington.

SOUSED MACKEREL (*Scomber scombrus*).

One case, two dozen 2-pound cans. Boston, Mass. Potter & Wrightington.

SOUSED MACKEREL (*Scomber scombrus*).

In 1-pound, 2-pound, 3-pound, and 4-pound cans. Boston, Mass. Henry Mayo & Co.

FRESH DEVILED CRABS (*Callinectes hastatus*).

Two cases of No. 1 and No. 2 cans. Hampton, Va. McMenamin & Co. "This is the meat of the crab carefully picked, seasoned, and packed in cans as above. The carapace or top shell of the crab accompanies each case of cans—a case of shells to each case of cans. These are filled from the cans, baked in a quick oven until nicely browned, and eaten from the shell; or the shells may be dispensed with, and the meat may be eaten from the can, or prepared into a variety of dishes. We are the pioneers in the packing of canned crabs. So far as we are able to learn, the idea was first conceived and put into execution by ourselves. Other similar establishments started afterwards, but to-day we are the only packers of canned crabs in America." (*McMenamin & Co.*)

FRIED HERRING (*Clupea harengus*).

In spiced vinegar. Two cases, in cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

HAMBURGER EELS (*Anguilla rostrata*).

In jelly. One dozen each, 1-pound and 2-pound cans. New York. Max Ams, 372 and 374 Greenwich street.

CANNED IN VINEGAR.

PICKLED EELS (*Anguilla rostrata*).

In jelly. In 2-pound cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

PICKLED EELS (*Anguilla rostrata*).

One case, in 1-pound, 2-pound, and 5-pound cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

PICKLED OYSTERS.

Two cases, two dozen bottles. Baltimore, Md. A. Booth.

CANNED IN OIL.

OIL "SARDINES."

Small herring (*Clupea harengus*) preserved in oil. One dozen quarter-cans. Eastport, Me. Wolff & Riesing.

OIL "SARDINES."

Alfred Elienne brand. Small sea-herring (*Clupea harengus*) preserved in oil. One dozen half-cans. Camden, Me.; office, 323 Greenwich street, New York. Rosenstein Brothers.

OIL "SARDINES."

Dubois brand. Small sea-herring (*Clupea harengus*) preserved in oil. One dozen quarter cans. Office, 323 Greenwich street, New York. Rosenstein Brothers.

OIL "SARDINES."

Louis Philippe brand. Small sea-herring (*Clupea harengus*) preserved in oil. One dozen quarter-cans. Camden, Me.; office, 323 Greenwich street, New York. Rosenstein Brothers.

CANNED DRY; SMOKED AND DRY-SALTED.

SMOKED SALMON (*Salmo salar*).

Lion and Unicorn brand. One case, four dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

SMOKED SALMON (*Salmo salar*).

Lion and Unicorn brand. One-half case, two dozen 1-pound flat cans. Boston, Mass. Potter & Wrightington.

FRESH SMOKED SALMON (*Salmo salar*).

One case, in cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

FRESH SMOKED SMELTS (*Osmerus mordax*).

One case, in cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

FRESH SMOKED EELS (*Anguilla rostrata*).

One case, in cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

SMOKED HALIBUT (*Hippoglossus vulgaris*).

Lion and Unicorn brand. One-half case, two dozen one-pound flat cans. Boston, Mass. Potter & Wrightington.

FRESH SMOKED STURGEON (*Acipenser* sp.).

One case, in cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

FRESH SMOKED FLOUNDERS (*Pseudopleuronectes americanus* and *Paralichthys* sp.).

Two cases, in cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

FRESH SMOKED BUCKLING (*Clupea harengus*).

One case, in cans. New York. S. Schmidt & Brother, 150 and 152 West Nineteenth street.

KIPPERED HERRING (*Clupea harengus*).

Three samples in one-pound oval cans. Boston, Mass. A. H. Bailey & Co.

BONELESS HERRING.

Blackwood's English boned brand. Smoked herring (*Clupea harengus*) stripped of skin and bones. Half dozen small tin boxes. Boston, Mass. L. Pickert & Co.

FINNAN HADDIES.

Smoked haddock (*Melanogrammus æglefinus*). Half dozen 1-pound cans. Boston, Mass. L. Pickert & Co.

FINNAN HADDIES.

Smoked haddock (*Melanogrammus æglefinus*). Three samples in 1-pound oval cans. Boston, Mass. A. H. Bailey & Co.

FINNAN HADDIES.

Smoked haddock (*Melanogrammus æglefinus*). One dozen 1-pound round cans. Portland, Me. Burnham & Morrill.

MINCED COD (*Gadus morrhua*).

Lion and Unicorn brand. Two cases, each two dozen 1-pound cans. Boston, Mass. Potter & Wrightington.

BONELESS COD.

Dry-salted cod (*Gadus morrhua*) stripped of skin and bones, cut into pieces, rolled, and packed in cylinder-shaped cans. Boston, Mass. L. Pickert & Co.

CANNED FISH-EXTRACTS.

STURGEON EXTRACT.

From sturgeon (*Acipenser* sp.). One case, containing twenty-four small cans. New York. Albany Beef Packing Company, 372 Greenwich street. "This is a novelty, and is what its name indicates, the extract of sturgeon meat, intended to be used for meat or fish sauces, soups, &c." (*Richard Weinacht*, secretary.)

VI.—MARINE PRODUCTS USED FOR CLOTHING.

17. FURS.

MAMMAL FURS.

SEA-OTTER (*Enhydra marina*).

Used for muffs, gloves, collars, cuffs, and trimmings. Dressed skin. Saint Paul's Island, Alaska. 12,262. Collected by H. W. Elliott.

OTTER (*Lutra canadensis*).

Used for muffs, trimmings, &c.
Dressed skin. Lake Superior. Value, $9.
Dressed skin, unplucked. Lake Superior. Value, $10.
Dressed skin. Western States. Value, $7.
Dressed skin, unplucked. Western States. Value, $8.
Dressed skin, unplucked. Florida. Value, $5.
B. H. Stinemetz & Son, Washington, D. C.

OTTER (*Lutra canadensis*).

Used for muffs, trimmings, &c. Dressed skin. White River, Puget Sound. 2,803. Collected by Dr. George Suckley.

BEAVER (*Castor canadensis*).

Used for linings and muffs.
Raw skin. Utah. Value, $6.50.
Dressed skin. Utah. Value, $7.
Raw skin. Lake Superior. Value, $8.
Dressed skin. Lake Superior. Value, $9.
B. H. Stinemetz & Son, Washington, D. C.

BEAVER (*Castor canadensis*).

Used for linings and muffs.
Dressed skin, light color, spotted. Bristol Bay, Alaska. M. 12,311. Collected by H. W. Elliott.

BEAVER (*Castor canadensis*).

Used for linings and muffs.
Dressed skin. Albino. M. 12,506. U. S. National Museum.

BEAVER (*Castor canadensis*).

Used for linings and muffs.
Dressed skin. M. 12,748. Collected by Dr. F. V. Hayden.

FUR-SEAL (*Callorhinus ursinus*).

Used for cloaks, hats, gloves, &c.
Three skins, in the hair, washed and dried.
Three skins, plucked and dressed, natural color.
Three skins, dressed and dyed light color.
Three skins, dressed and dyed dark color.
From Prybilov Islands, Alaska. Alaska Commercial Company, San Francisco, Cal.

FUR SEAL (*Callorhinus ursinus*).

Used for cloaks, hats, &c.
One skin, unplucked, washed and dried.
One skin, plucked, undressed.
One skin, plucked and dressed.
From Alaska. Prepared by G. C. Treadwell & Co., Albany, N. Y.

ANTARCTIC FUR-SEAL (*Arctocephalus aucklandicus*).

Used for cloaks, hats, &c.
One skin, plucked, dressed and dyed. Staten Island, near Cape Horn. 25,759.
One skin, plucked, dressed, and dyed. South Georgia Islands, South Atlantic. 25,760.
One skin, plucked, dressed, and dyed. Islos de Diego Ramires, near Cape Horn. 25,762. Dressed and dyed by G. C. Treadwell & Co., Albany, N. Y.

MUSQUASH OR MUSKRAT (*Fiber zibethicus*).

Used for muffs, capes, caps, and linings, and imitations of beaver fur.
Raw skin. Brown. Eastern States. Value, 20 cents.
Raw skin. Black. Eastern States. Value, 25 cents.
B. H. Stinemetz & Son, Washington, D. C.

FISHER OR PEKAN (*Mustela Pennanti*).

Used for linings. Dressed skin. Fort Steilacoom, Washington Territory. 2,000. Collected by Dr. George Suckley.

MINK (*Putorius vison*).

Used for cloaks and muffs. Dressed skin. Cape Flattery, Washington Territory. 2,387. Collected by Dr. George Suckley.

MINK (*Putorius vison*).

Used for cloaks and muffs.
Dressed skin, unplucked. Eastern States. Value, $1.25.
Dressed skin, unplucked. Western States. Value, 65 cents.
Dressed skin, unplucked. Middle States. Value, 75 cents.
B. H. Stinemetz & Son. Washington, District of Columbia.

BIRD FURS.

CAPE OR ROBE.

Made from down of the loon (*Colymbus torquatus*). Made by Makah Indians. Neah Bay, Washington Territory. 1,296. Collected by J. G. Swan.

ROBE.

Made from skins of the brown pelican (*Pelecanus fuscus*). Worn by females. Tiburon Islands, Sonora. 9,559. Collected by Dr. E. Palmer.

18. LEATHERS.

(Embracing the hides in a rough state, in the various stages of dressing, and manufactured into shoe-leather, satchels, shoes, &c.)

PREPARED FROM MAMMAL-SKINS.

LEATHER.

Made from skin of sea-lion (*Eumetopias Stelleri*), and used by Aleutian Islanders for covering canoes. Alaska. 11,371. Collected by Vincent Colyer.

BAG.

Made from skin of banded seal (*Histriophoca fasciata*). Cape Romanzoff, Alaska. 7,580. Collected by W. H. Dall.

PACKING BAG.

Made of entire skin of saddle-back seal. Alaska. 38,876. Collected by E. W. Nelson.

SEAL-SKIN BAG.

Made of whole seal-skin, with lacings of raw hide. Anvik, Alaska. 38,796. Collected by E. W. Nelson.

HARPOON LINE.

Made of strips of seal-skin. Alaska. 19,376. Collected by Rev. James Curley.

QUIVER.

Made of seal-skin. Length, 28¾ inches; width, 6 inches. Ooglaamie, Point Barrow, Alaska, 1882. 72,788. Collected by Lieut. P. H. Ray, U. S. A.

INTESTINE OF SEAL.

Prepared by the natives and used for waterproof clothing. Yukon River, Alaska. 5,570. Collected by Dr. W. H. Dall.

HARPOON LINE.

Made of Walrus hide. Alaska. 15,617. Collected by H. W. Elliott. Walrus leather is used by Eskimos for harness, thongs, seal nets, and for other purposes.

PREPARED FROM REPTILE-SKINS.

ALLIGATOR LEATHER GOODS.

Exhibited by Tiffany & Co., Union Square, New York.

2. Skin. Extra Large. Natural color. Value, $10.
3. Skin. Medium size. Natural color. Value, $6.
4. Skin. Medium size. Black. Value, $6.
5. Skin. Extra large. Black. Value, $12.
6. Skin. Large. Green. Value, $8.
7. Skin. Medium size. Brown. Value, $6.
8. Skin. Medium size. Red. Value, $6.
9. Skin. Medium size. Cream color. Value, $6.
10. Skin. Medium size. Yellow. Value, $6.
11. Skin. Medium size. White. Value, $7.
12. Student's bag. Natural color. Value, $28.
13. Shopping bag. Natural color. Value, $13.
14. Ladies' bag. Small. Natural color. Value, $14.
15. Ladies' bag. Large. Natural color. Value, $24.
16. Railroad bag. Natural color. Value, $36.
17. Gent's bag. Natural color. Value, $45.
18. Dress suit bag. Natural color. Value, $56.
19. Carriage reticule. Natural color. Value, $28.
20. Photograph case. Carte de Visite. Natural color. Value, $5.
21. Photograph case. Imperial. 4 pictures. Natural color. Value, $15.
22. Photograph screen. Imperial. 2 pictures. Natural color. Value, $14.
23. Photograph screen. Imperial. 3 pictures. Natural color. Value, $20.

ALLIGATOR LEATHER GOODS—Continued.

24. Photograph screen. Imperial. 4 pictures. Natural color. Value, $28.
25. Music roll. Black. Value, $12.
26. Shawl strap. Natural color. Value, $15.
27. Court-plaster case. Natural color. Value, $3.
28. Court-plaster case. Black. Value, $3.
29. Bill book. Natural color. Value, $13.
30. Bill book. Natural color. Value, $13.50.
31. Cigar case. Natural color. Value, $4.
32. Jewel box. Natural color. Value, $20.
33. Traveling mirror. Natural color. Value, $11.
34. Traveling mirror. Green. Value, $11.
35. Traveling mirror. Black. Value, $11.
36. Traveling mirror. Red. Value, $11.
37. Belt with silver buckle. Natural color. With silver smelling bottle and silver chatelaine. Value, $39.75.
38. Bag with silver mountings. Natural color. Belt with silver buckle. Natural color. Chatelaine attached. Value, $76.
39. Cigarette case. Natural color. Value, $2.50.
40. Cigarette case. Black. Value, $2.50.
41. Cigarette case. Red. Value, $2.50.
42. Cigarette case. Brown. Value, $2.50.
43. Cigarette case. White. Value, $2.50.
44. Cigarette case. Natural color. Value, $2.50.
45. Pocket-book. Natural color. Value, $11.
46. Pocket-book. Black. Value, $11.
47. Pocket-book. White. Value, $10.
48. Envelope. Natural color. Contains 2 razors, button hook, glove hook, nail file, pocket knife, 2 pairs scissors. Value, $28.
49. Envelope. Natural color. Contains button-hook, glove-hook, nail-file, pocket-knife, nail-brush, nail-powder box, and two pairs scissors. Value, $20.
50. Card case. Red. Value, $6.50.
51. Card case. Brown. Value, $6.50.
52. Card case. White. Value, $5.50.
53. Card case. Black. Value, $5.50.
54. Card case. Green. Value, $5.50.
55. Card case. Natural color. Value, $5.50.
56. Belt with silver buckle. Natural color. Also, bag with silver mountings, natural color. Silver chatelaine. Value, $105.
57. Cigarette case. Brown. Value, $7.50.
58. Cigarette case. Black. Value, $7.50.
59. Cigarette case. Natural color. Value, $7.50.
60. Cigarette case. White. Value, $7.50.
61. Cigarette case. Red. Value, $8.50.

ALLIGATOR LEATHER GOODS—Continued.

62. Cigarette case. Green. Value, $8.50.
63. Card case. Black. Value, $20.
64. Card case. Natural color. Value, $30.
65. Card case. Red. Value, $17.
66. Card case. Natural color. Value, $9.50.
67. Card case. White. Value, $17.
68. Card case. Natural color. Value, $10.50.
69. Cigar case. White. Value, $14.
70. Cigar case. Red. Value, $14.
71. Cigar case. Natural color. Value, $14.
72. Cigar case. Black. Value, $14.
73. Cigar case. Green. Value, $14.
74. Cigar case. Brown. Value, $14.
75. Cigar case. Natural color. Value, $30.
76. Cigar case. Black. Value, $30.
77. Cigar case. Brown. Value, $27.
78. Cigar case. Red. Value, $24.
79. Cigar case. White. Value, $24.
80. Cigar case. Green. Value, $30.
81. Cigar case. Brown. Value, $30.
82. Cigar case. White. Value, $35.
83. Visiting book. Natural color. Value, $6.
84. Visiting book. Natural color. Value, $24.
85. Cigar case. Natural color. Value, $10.
86. Cigar case. Black. Value, $10.
87. Cigar case. White. Value, $10.
88. Cigar case. Red. Value, $11.50.
89. Cigar case. Brown. Value, $11.50.
90. Cigar case. Natural color. Value, $11.50.
91. Cigar case. Natural color. Value, $10.
92. Cigar case. Black. Value, $10.
93. Cigar case. Brown. Value. $13.50.
94. Cigar case. White. Value, $13.50.
95. Cigar case. Green. Value, $11.
96. Cigar case. Red. Value, $11.
97. Shawl strap. Natural color. Value, $35.
98. Prescription book. Natural color. Value, $5.
99. Prescription book. Natural color. Value, $5.
100. Pocket-book. Natural color. Value, $10.
101. Pocket-book. Black. Value, $10.
102. Pocket-book. Natural color. Value, $20.
103. Pocket-book. Natural color. Value, $24.
104. Pocket-book. Natural color. Value, $18.
105. Pocket-book. Natural color. Value, $18.
106. Pocket-book. Natural color. Value, $30.

ALLIGATOR LEATHER GOODS—Continued.

107. Pocket-book. Natural color. Value, $30.
108. Steamer bag. Natural color. Contains button-hook, glove-hook, pair scissors, nail-file, nail-cleaner, and pocket knife. Value, $26.
109. Steamer bag. Natural color. Contains pocket knife, nail-file, nail-cleaner, button hook, pair scissors, xyphometer, and mirror. Value, $40.
110. Steamer bag. Natural color. Contains nail-file, pair scissors, glove-buttoner, mirror, paper-knife, and fruit-knife. Value, $125.
111. Dog-collar, with silver mountings. Brown. Value, $13.
112. Dog-collar, with silver mountings. Black. Value, $15.
113. Dog-collar, with silver mountings. Natural color. Value, $17.
114. Belt, with silver buckle. Natural color. Also, bag with silver mountings. Natural color. Silver chatelaine. Value, $63.50.
115. Belt with silver buckle. Natural color. Also, bag with silver mountings, and chatelaine. Natural color. Value, $56.
116. Belt, with silver buckle. Natural color. Also, bag with silver mountings, and chatelaine. Natural color. Value, $76.
117. Belt, with silver buckle. Natural color. Also, bag with silver mountings, and chatelaine. Natural color. Value, $72.
118. Belt, with silver buckle. Natural color. Silver chatelaine and silver smelling-bottle. Value, $68.
119. Dog-collar, with silver mountings. Natural color. Value, $10.
120. Dog-collar, with silver mountings. Red. Value, $12.
121. Dog-collar, with silver mountings. White. Value, $14.
122. Ladies' dressing case. Natural color. Contains 2 powder boxes, 2 soap boxes, 2 pomatum boxes, tooth-brush bottle, hair-pin bottle, long cologne bottle, short cologne bottle, inkstand, tooth-powder box, matchbox, mirror, shoe-lift, hair-brush, clothes-brush, bonnet-brush, comb, 3 pairs scissors, 2 xyphometers, nail-file, nail-cleaner, button-hook, stiletto, tweezers, corkscrew, corn-knife, and pocket-knife. Value, $500.
123. Gent's dressing case. Natural color. Contains soap box, powder box, tooth-brush box, tooth-powder box, 2 pomatum boxes, long cologne bottle, short cologne bottle, soap box, powder box, shaving-brush, shoe-lift, mirror, inkstand, paper-knife, 2 razors, razor-strop, comb, hair-brush, hat-brush, clothes-brush, nail-file, corkscrew, tweezers, stiletto, nail-cleaner, 2 corn-knives, xyphometer, 2 pairs scissors. Value, $650.
124. Dressing case, "Compact." Natural color. Contains cologne bottle, pomatum bottle, soap box, shaving-brush, razor, razor-strop, comb, hair-brush, mirror, pair scissors, pocket-knife, button-hook, and nail-cleaner. Value, $155.
125. Pocket-book. Green. Value, $11.

ALLIGATOR LEATHER GOODS—Continued.

126. Pocket-book. Natural color. Value, $20.
127. Pocket-book. Natural color. Value, $20.
128. Pocket-book. Natural color. Value, $20.
129. Pocket-book. Natural color. Value, $18.
130. Pocket-book. Natural color. Value, $18.
131. Pocket-book. Natural color. Value, $18.
132. Cigar case. Natural color. Value, $6.50.
133. Cigar case. White. Value, $6.50.
134. Cigar case. Brown. Value, $6.50.
135. Cigar case. Natural color. Value, $6.50.
136. Cigar case. Red. Value, $6.50.
137. Cigar case. Black. Value, $6.50.
138. Cigarette case. Black. Value, $22.
139. Cigarette case. Green. Value, $23.
140. Cigarette case. Red. Value, $23.
141. Cigarette case. Brown. Value, $24.
142. Cigarette case. White. Value, $23.
143. Cigarette case. Natural color. Value, $23.
144. Card case. Natural color. Value, $30.
145. Card case. Natural color. Value, $38.
146. Card case. Natural color. Value, $20.
147. Card case. Natural color. Value, $22.
148. Card case. Natural color. Value, $16.
149. Card case. Natural color. Value, $22.
150. Pocket-book. Natural color. Value, $100.
151. Belt with silver buckle. Natural color. Silver chatelaine and silver bottle. Value, $69.50.
152. Belt with silver buckle. Natural color. Silver chatelaine and silver bottle. Value, $73.
153. Belt with silver buckle. Brown. Silver chatelaine and silver bottle. Value, $80.50.
154. Belt with silver buckle. Natural color. Silver chatelaine and silver bottle. Value, $39.50.
155. Belt with silver buckle. Natural color. Silver chatelaine and silver bottle. Value, $39.50.
156. Card case. Natural color. Value, $75.
157. Card case. Natural color. Value, $75.
158. Cigar case. Natural color. Value, $18.
159. Cigar case. Natural color. Value, $22.
160. Blotter. Red. Value, $22.
161. Blotter. Natural color. Value, $22.
162. Blotter. Brown. Value, $22.
163. Blotter. Black. Value, $22.
164. Blotter. Brown. Value, $35.
165. Blotter. Natural color. Value, $30.

ALLIGATOR LEATHER GOODS—Continued.

166. Blotter. Red. Value, $65.
167. Blotter. Natural color. Value, $60.
168. Blotter. Black. Value, $80.
169. Railroad bag; fitted. Natural color. Contains tooth-brush bottle, shaving-brush bottle, long cologne bottle, short cologne bottle, flat cologne bottle, pomatum-jar, tooth-powder jar, soap-box, flask, shaving brush, soap-box, two pairs scissors, cork-screw, nail-file, cigar case, xyphometer, jewel-box, nail-cleaner, memorandum-book, comb, court-plaster case, two razors, razor strop, corn-knife, hair-brush, two pocket-knives, cloth-brush, button-hook, hat-brush, tweezers, and mirror. Value, $875.
170. Bag; fitted. Natural color. Contains tooth-brush bottle, hair-pin bottle, soap-box, pomatum-jar, long cologne bottle, short cologne bottle, flat cologne bottle, salts bottle, inkstand, tooth-powder box, jewel-box, needle-case, paper-cutter, comb, hair-brush, cloth-brush, bonnet-brush, shoe-horn, mirror, button-hook, nail-file, stiletto, tweezers, corkscrew, xyphometer, pocket-knife, two pairs scissors, corn-knife, and nail-cleaner. Value, $575.
171. Skin, medium size. Natural color. Value, $6.

ALLIGATOR LEATHER GOODS.

Exhibited by H. J. Mahrenholz, 1125 Broadway, New York.

1. Gondola slippers. Green. One pair, 1–14, 7½ D. Value, $8.50.
2. Gondola slippers. Red. One pair, 3–12, 4½ C. Value, $8.50.
3. Russet alligator slippers. One pair, 2–13, 6½ Q. Value, $7.50.
4. Gondola slippers. Green. One pair, 5–10, 4½ D. Value, $8.50.
5. House slippers. One pair, 4–11, 6½ 3. Value, $7.50.
6. Ladies' Oxford ties. Dark red. One pair, 21–36, 3 C. Value, $12.50.
7. Ladies' Creoles slippers. One pair, 34–35, 3½ B. Value, $7.50.
8. Men's Oxford ties. One pair, 6–9, 6 C. Value, $14.
9. Balmorals. White duck tops. One pair, 23–24, 7 C. Value, $16.
10. Hunting boots. One pair, 7–8, 7½ D. Value, $50.
11. Hunting shoes. One pair, 31–32, 8 E. Value, $20.
12. Riding boots. One pair, 30–33, 8 C. Value, $30.
13. Lady D'Orsey shoes. Black, satin-lined. One pair, 26–27, 4 A. Value, $12.
14. Lady D'Orsey shoes. Red, satin-lined. One pair, 37–38, 4½ C. Value, $12.
15. Ladies' Oxford ties. Blue, satin-lined. One pair, 15–20, 4 B. Value, $14.
16. Oxford ties. Russet color, satin-lined. One pair, 16–19, 4 C. Value, $14.

ALLIGATOR LEATHER GOODS—Continued.

17. Ladies' Oxford ties. Red, satin lined. One pair, 17–18, 4 C. Value, $14.
18. Lady D'Orsey shoes. Red, satin-lined. One pair, 24–29, 4½ C. Value, $12.
19. Lady D'Orsey shoes. Russet color, satin-lined. One pair, 25–28, 3 C. Value, $12.

LEATHER PREPARED FROM FISH SKINS.

SALMON SKINS.

Dressed as leather and used in making water-proof shirts and boots by Magemut Eskimo. Nunivak Island, Alaska. 16,091. Collected by Dr. W. H. Dall.

PARKY.

An upper garment made from the skin of codfish (?). Nunivak Island, Alaska. 10,347. Collected by Mr. W. H. Dall.

EEL SKINS.

Highly esteemed by the Virginia negroes as a cure for rheumatism. Washington, D. C. 25,285. Collected by G. Brown Goode.

STURGEON LEATHER.

Tanned skin of lake sturgeon (*Acipenser rubicundus*). Waukegan, Ill. 26,013. Wernich & Wandel.

FISH SKINS.

Tanned skins of fish. Used by Eskimo for making boots. Anvik, Alaska. 38,795. Collected by E. W. Nelson.

BOOTS.

Made of tanned fish skins. Anvik, Alaska. 38,794. Collected by E. W. Nelson.

OVERALL-DRESS.

Made of tanned fish skins. Lower Yukon River, Alaska. 38,817. Collected by E. W. Nelson.

FISH-SKIN.

Skin of dogfish (*Squalus americanus*). Used for polishing mackerel jigs, &c. Gloucester, Mass. U. S. Fish Commission.

LEATHER.

Made from skins of cod (*Gadus morrhua*) Gloucester, Mass., 1882. Gloucester Isinglass and Glue Company.

LEATHER.

Made from skins of cusk (*Brosmius brosme*). Gloucester, Mass., 1882. Gloucester Isinglass and Glue Company.

SHOES.

Pair of "Newport ties," made from skins of cusk (*Brosmus brosme*). Gloucester, Mass., 1882. Gloucester Isinglass and Glue Company.

VII.—MATERIALS EMPLOYED IN THE ARTS AND MANUFACTURES.

19. IVORY AND BONE.

IVORY OF MAMMALS.

PAIR OF TUSKS OF WALRUS (*Rosmarus*).

One tusk is 41 inches long and weighs 12¼ pounds; the other is the same length and weighs 12½ pounds. Alaska. Loan of Alaska Commercial Company, San Francisco, Cal.

MANUFACTURED IVORY OF WALRUS.

Ivory in rough state. 24,819. Cane handles. 24,815–6. Chain and cross. 24,812. Knobs of ivory. 24,814. Scarf-slide. 24,813. Sword-handles. 24,817–8. Knife-handles. 24,820–2. Crochet-handles. 24,823. New York. U. S. Fish Commission.

TUSKS OF WALRUS.

Scrimshawed with female figures and made into a picture frame. Noank, Conn. Capt. H. C. Chester.

IVORY OF NARWHAL (*Monodon monoceros*).

Specimen of tusk. New Bedford, Mass. Collected by J. T. Brown.

TEETH OF SPERM-WHALE (*Physeter macrocephalus*).

Rough. New Bedford, Mass. 15,290. Gift of G. J. Nickerson.

TEETH OF SPERM-WHALE (*Physeter macrocephalus*).

Polished. Newport, R. I. 24,906–8. Gift of J. H. Clark.

TOOTH OF SPERM-WHALE (*Physeter macrocephalus*).

Scrimshawed and mounted as watch case; figure of American eagle. Newport, R. I. 24,905. Gift of J. H. Clark.

TOOTH OF SPERM-WHALE (*Physeter macrocephalus*).

Scrimshawed with figure of crucifix and flowers. Newport, R. I. 24,904. Gift of J. H. Clark.

TOOTH OF SPERM-WHALE (*Physeter macrocephalus*).

Scrimshawed with figure of whaling ship. Newport, R. I. 24,901. Gift of J. H. Clark.

TOOTH OF SPERM-WHALE (*Physeter macrocephalus*).

Scrimshawed with figure of America in colors. Newport, R. I. 24,902. Gift of J. H. Clark.

TOOTH OF SPERM-WHALE (*Physeter macrocephalus*).

Scrimshawed with this legend: "Taken by the ship Montreal, of London, in the Pacific ocean from a one-hundred barrel whale, — * —, 1835." Washington, D. C. 7,659. Gift of Mrs. Dove.

TOOTH OF SPERM-WHALE (*Physeter macrocephalus*).

Scrimshawed with figure of General Washington and American eagle. New Bedford, Mass. 24,888. Gift of George J. Nickerson.

IVORY BALLS.

Turned from teeth of sperm-whale. New York. 24,836. Joseph Shardlow.

IVORY OF REPTILES.

JEWELRY.

Various articles of jewelry made from teeth of alligator (*Alligator mississippiensis*). Jacksonville, Fla. 26,895. E. F. Gilbert. Alligator teeth are extensively used for jewelry, whistles, cane handles, buttons, &c.

BONE OF MAMMALS.

"OS MIRABILIS" OF WALRUS.

Alaska. 9,476. Gift of General George H. Thomas, U. S. A.

JAW-BONE OF A SPERM-WHALE.

In a crude state. 29,374. U. S. National Museum.

PARASOL-HANDLES.

Made from sperm-whale's jaw. Philadelphia. 29,232–5. Harvey & Ford.

CHOPPING-KNIFE.

Made from sperm-whale's jaw. 24,909. Prof. S. F. Baird.

SAIL-THIMBLE.

Made from bone of whale. Beverly, Mass. 25,791. Gift of J. W. Foster.

SEAM RUBBER.

Made from the jaw-bone of sperm-whale. Used by sail-makers to rub along seams. Beverly, Mass. 25,793. Gift of Frank Westerberger.

SAIL-MAKER'S HAND-FID.

Made at sea from jaw-bone of sperm-whale. Middletown, Conn. 25,650. Gift of A. R. Crittenden.

SAW-FRAME.

Made at sea from bone of sperm whale. New Bedford, Mass. 25,655. Gift of I. H. Bartlett & Sons.

PULLEY.

Made from jaw-bone of sperm-whale. Provincetown, Mass. 25,801. Gift of E. H. Cook.

PULLEY BLOCK.

Made at sea from jaw-bone of sperm-whale. Middletown, Conn. 25,649. Gift of A. R. Crittenden.

SEINE NEEDLE.

Made from jaw-bone of sperm-whale. Wellfleet, Mass. 25,713. Gift of N. H. Payne.

COG-WHEEL.

A rachet-wheel made of ivory (pan of sperm-whale jaw). Length, $4\frac{3}{4}$ inches. New Bedford, Mass., 1882. 57,064. Gift of Daniel Kelleher. Scrimshaw work, made at sea by a whaleman for some mechanical device.

20. BALEEN.

WHALEBONE IN A CRUDE STATE.

WHALEBONE.

Bunch of long strips prepared by the Eskimo. Mackenzie River District, 1863. 1,116. Collected by Robert MacFarlane.

WHALEBONE.

Bunch of long strips prepared by the Eskimo. Mackenzie River District, 1863. 1,108. Collected by Robert MacFarlane.

ATLANTIC FINBACK WHALEBONE.

Slab of baleen or whalebone from jaw of finback whale (*Sibbaldius tectirostris*). Provincetown, Mass., 1882. 57,197. Collected by J. T. Brown.

PACIFIC FINBACK WHALEBONE.

Slabs of baleen or whalebone from jaw of finback whale of California. Coast of California. 12,312. Collected by Capt. C. M. Scammon. This entire series of slabs are from one side of the whale's jaw.

SULPHUR-BOTTOM WHALEBONE.

Slab of baleen or whalebone from jaw of Pacific sulphur-bottom whale (*Sibbaldius sulfureus.*) Port Townsend, Washington Territory. 72,692. Collected by J. G. Swan.

CALIFORNIA GRAY WHALEBONE.

Slabs of baleen or whalebone from jaw of California gray whale (*Rhachianectes glaucus*). Coast of California. 12,052. Collected by Capt. C. M. Scammon.

ATLANTIC HUMPBACK WHALEBONE.

Slab of baleen or whalebone from jaw of humpback whale of the Atlantic Ocean. Length, 7 feet 5 inches. New Bedford, Mass., 1883. 57,136. Gift of I. H. Bartlett & Sons.

PACIFIC HUMPBACK WHALEBONE.

Slabs of baleen or whalebone from jaw of Pacific humpback whale (*Megaptera versabilis*). Coast of California. 12,311. Collected by Capt. C. M. Scammon.

SOUTH SEA WHALEBONE.

Slab of baleen or whalebone from jaw of South Sea right whale. Length, 6 feet 3 inches. New Bedford, Mass., 1883. 57,132. U. S. Fish Commission.

NORTHWEST WHALEBONE.

Slab of baleen or whalebone from jaw of Northwest coast, or Pacific right whale (*Balæna Sieboldii*). Length, 7 feet 2 inches. New Bedford, Mass., 1883. 57,134. U. S. Fish Commission.

JAPAN WHALEBONE.

Slab of baleen or whalebone from jaw of right whale. Length, 8 feet 4 inches. New Bedford, Mass., 1883. 57,135.

NORTHWEST WHALEBONE.

Slabs of baleen or whalebone from jaw of Pacific right whale (*Eubalæna Sieboldii*) taken in the North Pacific Ocean. Collected by Capt. C. M. Scammon. 15,402.

ARCTIC WHALEBONE.

Slab of baleen or whalebone from jaw of Bowhead whale (*Balæna mysticetus*), taken in Pacific Arctic Ocean by bark Fleetwing, in May, 1882. Length, 10 feet 4 inches. New Bedford, Mass., 1882. 57,575. Gift of J. & W. R. Wing.

ARCTIC WHALEBONE.

Slab of baleen or whalebone from jaw of Arctic or Bowhead whale (*Balæna mysticetus*). Length, 9 feet 5 inches. New Bedford, Mass., 1883. 57,133. Gift of I. H. Bartlett & Sons.

WHALEBONE IN A MANUFACTURED STATE.

WHALEBONE, STEAMED, SPLIT, AND POLISHED.

1. Dress-bone. Whalebone prepared for dress-maker's use. 24,950.
2. Whalebone. Prepared for suspender-maker's use. 24,946.
3. Whalebone. Prepared for bonnet-maker's use. 24,945.
4. Whalebone. Prepared for umbrella-maker's use. 24,941.
5. Whalebone. Prepared for parasol-maker's use. 24,940.
6. Gross dress-bone. Whalebone prepared for dress maker's use. 24,951.
7. White dress-bone. Whalebone (white) prepared for dress-maker's use. 24,948.
8. Whalebone. Prepared for brush-maker's use. 24,978.
9. Whalebone. Prepared for ribbon-weaver's use. 24,942.
10. Whalebone. Prepared for hat-maker's use. 24,943.
11. Whalebone. Prepar d for cap-maker's use. 24,944.
12. Whalebone. Prepared for neck-stock-maker's use. 24,947.
13. Whalebone. Prepared for corset-maker's use. 24,952.
14. Round dress-bone. Whalebone prepared for dress-maker's use. 24,949.
15. Whalebone cane, plain. 24,937.
16. Whalebone cane, twisted. 24,936.
17. Whalebone cane. Black and white, twisted. 24,938.
18. Whalebone boot-shanks. 24,973.
19. Whalebone tongue-scrapers. 24,967.
20. Whalebone probang. 24,966.
21. Whalebone riding-whip. Made of black and white whalebone, twisted. 24,935.
22. Whalebone riding-whip. 24,934.
23. Whalebone graining-comb. Used by painters. 24,972.
24. Whalebone caterpillar brush. 24,980.
25. Whalebone shavings. Used by upholsterers. 24,981.
26. Whalebone back supporter. 24,963.
27. Whalebone flue brush. 24,979.
28. Sample whalebone. 24,983.
29. Whalebone divining-rod. 24,959.
30. Whalebone hip busk-bone. 24,954.
31. Whalebone. Price list, samples. 24,984.
32. Whalebone busk. 24,961.
33. Whalebone. Prepared for artificial fore-arms. 24,964.
34. Whalebone plait-raiser. 24,968.
35. Whalebone pen-holder. 24,969.
36. Whalebone corset-clasps. 24,953.
37. Whalebone drill-bow. 24,960.
38. Whalebone billiard-cushion springs. 24,957.
39. Whalebone paper-cutter. 24,971.

WHALEBONE, STEAMED, SPLIT, AND POLISHED—Continued.

40. Whalebone rule. 24,985.
41. Whalebone. Prepared for whip-maker's use (patent). 24,982. Boston, Mass. Prepared at factory of J. A. Sevey.

WHIP-STALK.

Whalebone and rattan; finished, ready for covering. 24,960. U. S. Fish Commission.

WHALEBONE AND RATTAN.

Fitted, ready for sticking together for whip-stalk. 24,859. Prepared by American Whip Company. Westfield, Mass.

CANE.

Walking-stick, made of whalebone (baleen), by a whaleman at sea (schrimshaw work). Heart, several pieces, wrapped spirally with strips of baleen and wormed with cord of the same material; three Turk's-heads (baleen) at top, bottom, and center. Length, 33 inches. Edgartown, Mass., 1882. Gift of J. W. Coffin. 56,897.

21. PLATES AND SCALES.

TORTOISE-SHELL.

TORTOISE-SHELL.

Pacific hawk's-bill turtle (*Eretmochelys squamata.*) Pacific coast. 12,387–90. U. S. Fish Commission.

COMMERCIAL TORTOISE-SHELL.

New Bedford, Mass., 1875. 24,890. Gift of George Y. Nickerson.

SCALES OF FISHES.

SCALES OF SHEEPSHEAD (*Archosargus probatocephalus*). Cape Cod to Florida; Gulf of Mexico.

1. Crude scales. 25,480.
2. Scales cleaned and prepared for use. 25,481.
3. Brooch and ear-rings. 25,482.
4. Sprays of flowers. 25,483–6.
5. Sprays of flowers, dyed. 25,487.
6. Necklace and cross. 25,488.
7. Brooch and ear-rings. 25,489.
8. Brooch and ear-rings, dyed. 25,490.

Philadelphia, Pa. Received from F. C. Keergaard & Co.

SCALES OF SHEEPSHEAD (*Archosargus probatocephalus*).

Frame containing wreath of fish-scale ornaments. Jacksonville, Fla. Mrs. George W. Frazier.

SCALES OF STURGEON (*Acipenser* sp.).

Dried and prepared for bric-a-brac, buttons, &c. New York. Albany Beef Packing Company. 372 Greenwich street.

22. PEARLS AND SHELLS.

PEARLS AND NACRE.

Embracing the pearl-yielding shells, with the pearls and the mother-of-pearl in the rough state, with the manufactured buttons, handles, and jewelry, pearl-powder, inlaid work, and *papier-maché*, ornamented with mother-of-pearl; ear-shells (*Haliotidæ*) used in manufacture of buttons, handles, inlaid work, and pearl-powder; pearl oysters (*Aviculidæ*), with pearls and nacre; river mussels (*Unionidæ*), with pearls and nacre, crude and polished.

(For list of specimens, see Section D, "Catalogue of the Economic Mollusca, &c.")

SHELLS.

Cameo shell and shells of *Cypræa*, *Rotella*, *Oliva*, *Turritella*, &c., mounted as buttons and jewelry, composition shell work for box covers and frames, made by gluing shells in mosaic; cuttle-fish bone from *Sepia officinalis*, used as a pounce, as a dentifrice, as polishing powders, for taking fine impressions in counterfeiting, and as food for birds; concretions from the stomach of *Astacus*, known as "crab's-eyes" and "crab-stones," and used as antacids; shell of king-crab (*Limulus polyphemus*), used as a boat-bailer.

(For list of specimens, see Section D, "Catalogue of Economic Mollusca," and Section B, Catalogue of Economic Crustaceans, &c.)

23. FISH GLUE AND ISINGLASS.

AIR-BLADDERS, OR SOUNDS OF FISH, AND FISH TONGUES, USED IN THE MANUFACTURE OF RIBBON ISINGLASS AND GLUE.

COD SOUND.

Air-bladders of cod (*Gadus morrhua*) dried. Used in the manufacture of ribbon isinglass. George's Bank. Cape Ann Isinglass and Glue Company. Rockport, Mass. 12,126.

COD SOUNDS.

Air-bladders of cod (*Gadus morrhua*), used for manufacture of fibrous isinglass. Liquid isinglass can also be made from these sounds. Value, 17 cents per pound, dry. Gloucester, Mass. Gloucester Isinglass and Glue Company.

HAKE SOUND.

Air-bladder of hake (*Phycis chuss*), split and dried. Used in manufacture of ribbon isinglass. Bay of Fundy. Cape Ann Isinglass and Glue Company. Rockport, Mass. 12,125.

HAKE SOUNDS.

Air-bladders of hake (*Phycis chuss*), split and dried, for manufacture of fibrous isinglass. Liquid isinglass can also be made from these sounds. George's Banks. Value, 75 cents per pound, dry. Gloucester, Mass. Gloucester Isinglass and Glue Company.

SQUETEAGUE SOUND.

Air-bladder of sea-trout, weak fish, or squeteague (*Cynoscion regalis*), used in manufacture of ribbon isinglass. Also used in dried state for clarifying cider. Long Island Sound to South Carolina. Cape Ann Isinglass and Glue Company. Rockport, Mass. 25,267.

"CRAB" SOUND.

Air-bladder of "foreign crab" (species unknown), used in manufacture of ribbon isinglass. Cape Ann Isinglass and Glue Company. Rockport, Mass. 25,268.

"TROUT" SOUND.

Air-bladder of foreign "sea-trout" (an unknown fish), used in manufacture of ribbon isinglass. East Indies. Cape Ann Isinglass and Glue Company. Rockport, Mass.

BOOK SOUND.

Air-bladder of beluga or sturgeon, used in the manufacture of ribbon isinglass. Russia. Cape Ann Isinglass and Glue Company. Rockport, Mass.

TONGUE SOUND.

Air-bladder of an unknown sciænoid fish. Used in the manufacture of ribbon isinglass. Venezuela. Cape Ann Isinglass and Glue Company. Rockport, Mass.

PURSE SOUND.

Air-bladder of an unknown fish. Used in manufacture of ribbon isinglass. Cape Ann Isinglass and Glue Company. Rockport, Mass.

RIBBON ISINGLASS FROM FISH SOUNDS.

(Made by soaking and rolling the sounds.)

RIBBON ISINGLASS.

First quality. Made from sounds or air-bladders of hake (*Phycis chuss* and *P. tenuis*). Rockport, Mass., 1880. 39,162. Cape Ann Isinglass and Glue Company.

RIBBON ISINGLASS.

Second quality. Made from sounds or air-bladders of hake (*Phycis chuss*) and cod (*Gadus morrhua*). Rockport, Mass., 1880. 39,163. Cape Ann Isinglass and Glue Company.

RIBBON ISINGLASS.

Third quality. Made from sounds or air-bladders of hake (*Phycis chuss*) and of other fish. Rockport, Mass., 1880. 39,164. Cape Ann Isinglass and Glue Company.

ISINGLASS.

Made from sounds of Lake sturgeon (*Acipenser rubicundus*). Lake Erie. 12,120. Sandusky, Ohio. Schacht Brothers.

ISINGLASS.

Prepared from air-bladder of sturgeon (*Acipenser* sp.). New York. S. Schmidt & Bro.

ISINGLASS.

Prepared from sturgeon (*Acipenser* sp.). One pint bottle. New York. Albany Beef Packing Company, 372 Greenwich street. "The use of this article is well known for clarifying purposes by confectioners, brewers, among twine dealers, and also for cement and manufacture of laces, &c."

INDIAN GLUE.

FISH TONGUES.

Dried tongues of fish (probably cod). Prepared and used by the Sitka Indians in making glue. Sitka, Alaska. 20,744. Collected by J. G. Swan.

GLUE FROM FISH HEADS AND BONES.

FISH GLUE.

Made from heads of cod (*Gadus morrhua*), cusk (*Brosmius brosme*), and other *Gadidæ*. This glue is not so strong as that made from fish-skins. Gloucester Isinglass and Glue Company. Gloucester, Mass.

BONE DUST OF STURGEON (*Acipenser* sp.).

Mixed with certain chemicals this dust is said to produce a very fine and durable cement for chinaware, &c. Albany Beef Packing Company, 372 Greenwich street. New York.

GLUE FROM FISH-SKINS.

Liquid isinglass for adhesive paper, labels, and envelopes; isinglass for court-plasters; pure fish glues (hard and liquid, free from salt), for leather belting, roll cots, card felting, &c. Exhibit of Gloucester Isinglass and Glue Company, Gloucester, Mass.

1. Sample of the stock selected for making glue just as it comes from the salt fish. "The cod (*Gadus morrhua*) and cusk (*Brosmius brosme*) skins are preferred to any others as they contain a larger percentage of glue or isinglass. Last year there were about 1,500 tons of this kind of stock used in Gloucester for glue and isinglass, at a value of $15 per ton."
2. Cod skins, after being cleaned and the salt removed, ready to be made into isinglass or liquid glue.
3. Cusk skins, after being cleaned and the salt removed, ready to be made into glue.
4. Hake (*Phycis chuss*) skins, after the salt has been removed and cleaned. The percentage of glue is small in these skins.
5. Haddock (*Melanogrammus æglefinus*) skins prepared for glue. The percentage of glue is small.
6. Pollock (*Pollachus carbonarius*) skins, after being cleaned and salt removed. The percentage of glue is small.
7. Show case or frame, with rolls of colored isinglass made from the skins of cod and cusk.

8, 9. Cod and cusk isinglass made from the skins. "It is used in very large quantities in the United States for the manufacture of court-plaster. The manufacturers produce yearly about $50,000 worth of goods."

10. Dry fish-glue made from haddock, hake, and pollock skins.
11. Liquid isinglass or glue used for gummed paper labels and envelopes, from cod skins.
12. Liquid isinglass, for the same use, made from cusk skins.
13. Liquid isinglass made from hake skins.
14. Liquid isinglass made from haddock skins.
15. Liquid isinglass made from pollock skins.
16. Mucilage made from fish-skins, for office and express uses.
17. Sample book of gummed paper from the Dennison Manufacturing Company, of Boston, Mass. "This was gummed with liquid isinglass; 10,000 reams of paper were used in the United States last year. The isinglass and labor on same would amount to

$25,000, and the paper would cost as much more. After this it goes to the printer and is worked up into all kinds of labels, &c. E. W. Dennison, president Dennison Manufacturing Company, No. 19 Milk street, Boston, says: 'We have used the liquid glue manufactured by the Gloucester Isinglass and Glue Company for the past six or seven years, and have found it constantly improving. We do not know of any substitute equal to it.'"

18. Scrap book wherein liquid isinglass is used; from D. Slote & Co., of New York. "They say: 'Gentlemen: We take pleasure in bearing testimony to the excellent quality of the liquid isinglass manufactured under John S. Rogers' patent process. We have used it extensively and find it a very superior article.'" (Daniel Slote & Co., Blank Book Manufacturers, William street, New York.)"
19. Leather belting wherein dry isinglass or glue is used. "Messrs. I. B. Williams & Son, of Dover, N. H., say: 'We have used your isinglass in cement for our leather belting for the last five or six years, and find it superior to anything we ever used.'"
20. Sheet glue, dried in pans, used in the manufacture of leather belting.
21. Card belting, prepared with liquid isinglass.
22. Isinglass made from fish-skins and used in the manufacture of adhesive plaster, corn and bunion plasters, gummed paper, and numerous other articles.
23. Samples of court-plaster, adhesive plasters, and corn and bunion plasters, made with liquid isinglass.
24. Spur's paper veneer put on wood with liquid glue; also, samples of same from Charles W. Spurr, of Boston, Mass.
25. Box-work where fish-glue is used for putting on velvet and plush, from George W. Brooks, Boston, Mass.
26. Liquid glue, in bottles, from fish-skins, for family use.
27. Glues and isinglass, put up in boxes for the trade.
28. Mechanics' liquid glue, for all kinds of wood-work, boots and shoes, paper boxes, &c., in cans.
29. Sample of "frozen" fish-glue.

FISH-GLUE AND ITS APPLICATIONS.

Exhibit by the Russia Cement Company, Gloucester, Mass., of liquid fish-glue, the skins used in its manufacture, and illustrations of its use in various industries.

1. Skins of cod (*Gadus morrhua*) and cusk (*Brosmius brosme*), desalted and ready for cooking and pressing to extract the glue. 56,905.

2. Residuum left in the bags after the glue has been pressed from the cooked skins. To be ground as fish guano. 56,906.
3. Le Page's mucilage. The crude glue from the cooking tanks and bags condensed to suitable consistency and preserved from decomposition by the addition of chemicals. 56,913.
4. Russia belting cement. Condensed more than mucilage and specially prepared for belting, card clothing, and top-roll manufacturers. 56,910.
5. Le Page's carriage glue. Of suitable consistency for fine wood-work. 56,911.
6. Le Page's liquid glue in bottles and cans. Adapted for general use at home. 56,912.
7. Le Page's fish-glue, No. 12, in cans. Adapted for ordinary wood-work. 56,914.
8 Le Page's fish-glue, No. 16, in cans. Prepared for boot and shoe manufacture. 56,915.
9. Le Page's fish-glue, No. 20 F, in cans. Prepared for manufacture of gum labels and similar uses. 56,916.
10. Le Page's fish-glue, No. 20 X, in cans. Prepared for sizing woolens and carpets. 56,917.
11. Le Page's fish-glue, No. O. C, in cans. Prepared for manufacture of table and floor oil-cloths. 56,918.
12. Le Page's bleaching glue, No. S. S., in cans. Prepared for sale to straw goods manufacturers. 56.919.
13. Le Page's bleaching glue, No. S. S., in cans. Reduced to suitable consistency, for use by manufacturers of straw hats, &c. 56,920.
14. Hard glue. Made from skins of cod and cusk. For general use. 56,922.
15. "Frozen glue." A preparation of white fibrous glue. Made from skins of cod and cusk. Adapted for brewers' use. 56,922.
16. Gummed paper. Prepared with glue from fish-skins. 56,931.
17. Calendars. Prepared with glue from skins of cod and cusk. 56,928.
18. Table oil-cloths. Samples of oil-cloth, fish-glue being used on the back to prevent the oil soaking through. 56,927.
19. Ladies' boot-heel. Built with fish glue, without the use of nails. 56,930.
20. Ladies' shoe. Cemented with glue from fish skins. The glue is used for attaching the linings to the uppers previous to sewing. Called by the trade "gumming"; for cementing the lap over the channel where the sole is sewed to the upper; for coating between the soles to prevent the oil from the upper leather from striking through and discoloring the sole. Called by the trade "oil proofing"; for building heels without the use

of nails or pegs; for "waxing" the thread with which the sole is sewed, making the thread run smoothly and glueing every stitch so that the boot will not rip. 56,925.

21. WOOD AND FELT.

Cemented with glue made from fish skins. Used by organ and piano makers. 56,903.

22. PARQUET FLOORING.

Model. Scale, 1½ inches to foot; constructed with glue from fish skins. 56,902.

23. PIECE OF PACKING-CASE.

Sample showing the manner in which fish-glue is used for sealing the joints of packing-cases (for exporting organs and pianos) for the purpose of excluding the moisture. 56,904.

24. SCRAP-BOOK.

Showing the use of fish-glue in the manufacture of Mark Twain's Scrap-Book. 56,926.

25. LEATHER BELTING.

Cemented with glue from fish skins. 56,924.

26. STRAW HATS.

Two colored and two bleached with glue or sizing from fish skins. 56,929.

27. FISH-SIGN.

Small pieces of wood glued together in shape of fish. 56,923.

28. CARRIAGE-AXLE.

Iron and wood cemented with glue from fish skins. "The iron axle is firmly glued to its wooden bed, making a perfect finish, excluding moisture from the joint, and greatly increasing its strength." 56,901.

29. QUILL.

This quill has a ferrule of hard wood, with the grain running spirally, let into an annular groove in the head and cemented with glue from fish skins. A sample of the quill is also shown. 56,899.

30. AGATE-EDGE SPOOL.

Made with felt cloth and glue from fish skins. 56,900.

"The fact that fish-glue, or isinglass, as it is generally called, is very much stronger and more flexible than glue made from the skins of animals, has long been known, but until within a few

USES OF FISH-GLUE—Continued.

years the high cost of the raw material and the great amount of labor involved in its manufacture have precluded its general adoption for mechanical purposes. It was known to the ancients by the name of *ichthyocolla*, or fish-glue, and is often alluded to by Dioscorides and Pliny. In different parts of the world it is obtained from the swimming bladders, or sounds, of different kinds of fish, and the isinglass of commerce is consequently of various qualities. The best is found among the varieties imported from Russia, particularly that which is brought to St. Petersburg from Astrakan, and said to be obtained from the sturgeon, called the beluga, of the Caspian Sea and the rivers flowing into it. These sounds, after being cleaned and dried, are called Russia isinglass, and were until within a few years largely used in the manufacture of cement for leather belting, also in other industries where adhesives of the greatest possible strength and flexibility are required. They are dissolved in water by boiling, and are generally used mixed with other glues.

"In America the sounds of hake and other fish, after being softened in water, are rolled by powerful machinery into very thin ribbons and dried, forming what is known as ribbon isinglass. This is used principally for the fining of beer.

"The Turks use a fish-glue for fastening precious stones in their settings, and the Laplanders join together the pieces of wood of which their bows are made with glue extracted from the skins of perch. This glue, which was made only in small quantities, owed a considerable portion of its wonderful tenacity to the fact that the *first time it dried was upon the article cemented.* But, though it has long been known that glue is much stronger when freshly made than after it has been dried and redissolved, it has been the custom, from time immemorial, to dry all glue into hard sheets or cakes, in order that it might thus be preserved from putrification until wanted for use. This is a tedious and expensive operation, involving great risk to both the manufacturer and consumer, as sudden changes in the weather while the glue is drying will often cause the total loss of a whole batch; or, what is worse for the consumer, may so taint the glue that, though saved to the manufacturer by subsequent drying, the injury which it has sustained will appear whenever it is dissolved for use. The evils of this method of making glue are so great that many attempts have been made to overcome them, and thousands of dollars have been expended by many large manufacturers in unsuccessful efforts to find some means of preserving glue in a liquid form without injury to its adhesive qualities. It was found, however, that

USES OF FISH-GLUE—Continued.

though glue could be preserved from decomposition, the acids employed for that purpose not only injured the material upon which the glue was used, but caused slow chemical changes in the glue itself, greatly impairing, and after a time completely destroying, its adhesiveness. The attempt was, therefore, abandoned, and, except in the preparation of glue for use in small quantities, where convenience was of more importance than strength or durability, the old method continued to be universally employed. This was the state of the art when the inventor of liquid fish glue began his experiments. His attention was first called to the practical difficulties to be encountered in the working of glue while engaged in the business of manufacturing furniture. Becoming convinced that there ought to be some way to avoid these difficulties, he commenced a long series of careful experiments, which, carried on through many discouragements and repeated failures, finally resulted in the discovery of a new method of manufacturing glue, by which it may be preserved in liquid form so as to retain its original strength for years in any climate.

"Careful experiment showed what kind of raw material possessed the qualities of strength and flexibility in the highest degree, and resulted in the production of the Russia Belting Cement, so called because it has proved to be superior to, and is largely used in place of, Russia isinglass. This cement, which is a liquid isinglass of great purity, specially prepared for use upon leather, is used by nearly all the large manufacturers of leather-belting in the United States, and is now being introduced in foreign countries.

"The isinglass, after being separated from the raw material by steam extractors, which allow the shortest possible exposure to heat, is passed through a refining process, by which any impurities contained in the liquid are removed. It is then brought down to the proper density by evaporators, designed expressly for this purpose, which perform their work without heating the liquid any hotter than can be comfortably borne by the naked hand. After being evaporated to the proper consistency the liquid isinglass is subjected to chemical treatment and run into cooling tanks, from which it is drawn into barrels ready for shipment.

"The business of preparing dried codfish for the market by stripping off the skins and bones and packing the fish in small boxes, which was commenced in the year 1872, had at this time grown to such magnitude that nearly 3,000 tons of skins and bones were produced annually in the city of Gloucester alone. A very small portion of this material was used in the manufact-

USES OF FISH-GLUE—Continued.

ure of hard glue, but all attempts to preserve the glue in a liquid form, for any length of time, had proved complete failures.

"The same process of treatment which had proved so successful in preserving the liquid isinglass before referred to was, however, found to be equally capable of preserving glue made from this material, and its manufacture was therefore immediately commenced.

"Further experiments developed the fact that certain chemicals, when combined with liquid glue so prepared, were protected from oxidation, so that when the glue was thinned down for sizing purposes the chemicals were in the best possible condition for action.

"One of the most valuable of the special preparations resulting from this discovery is bleaching glue for the sizing of straw goods. By the use of this glue the process of sulphur bleaching is entirely dispensed with, as the sizing itself bleaches the goods so perfectly that not only is half the work saved, but straw and chip goods sized with it, instead of turning yellow, *grow whiter with age*, and possess a gloss unattainable by the use of any other glue.

"For sizing textile fabrics the No. 20 X is found to be specially valuable on account of its flexibility and the extreme smoothness which it gives to the yarn, so that, as a prominent manufacturer remarked, 'it goes through the looms as if greased.'

"For the manufacture of table oil-cloths a special grade is prepared called "O. C." glue, by the use of which the oil and paint is prevented from striking through the cloth, while the smoothness and flexibility of the goods are very greatly improved.

"For gummed paper and envelopes the No. 20 F is unequaled, being so extremely adhesive that only a very thin coating need be applied to the paper. It is more economical than any other substance used for the purpose; does not curl the paper; can be printed over without injury to the type; is pleasant to taste and smell; and being preserved *without the use of poisonous acids*, will not discolor the paper or make the tongue sore, which is a serious objection to many other glues.

"For court-plaster it is preferred above all other adhesives, its ingredients making it not only absolutely harmless, but positively beneficial when used as a dressing for wounds.

"In the manufacture of artificial flowers it is found to give an elastic, glossy finish, and brings out the colors in a manner unattainable by the use of any other glue.

"In taxidermy it is superior to anything known for sticking in feathers and resisting the action of moths and insects.

USES OF FISH-GLUE—Continued.

"For family and office use the bottle glue for general repairing, and the mucilage for gumming paper, are considered very convenient. Not only articles of wood, but crockery, glass, and even cast iron can be repaired with it so as to bear the rough handling of daily use. A little tissue paper, applied with either the family glue or the mucilage, makes an excellent dressing for flesh wounds, as it holds the parts in perfect position, and causes rapid healing, being composed of the same substances as the best court-plaster, and having no deleterious ingredient whatever.

"For wood-work it possesses properties of such peculiar value that in some branches of this industry operations are now easily performed which would be exceedingly difficult, if not impossible, with any other glue.

"Le Page's carriage glue is specially designed for use upon fine wood-work, and is largely used by house joiners and other workers in fancy woods, for whose convenience it is put up in tin cans ready for use. Its points of advantage over other glues are—

1. "Being a liquid it is always ready for use, and can be applied as easily as paint.
2. "It is very much stronger than any other glue.
3. "Being very fine grained it will 'go further' than any other glue, spreading out better and making a closer joint.
4. "If the parts do not come together properly the glue itself will make strong work, even in a very open joint, only it will take longer for it to dry.
5. "Work glued with it will stand exposure to moisture and heat better than that done with any other glue.
6. "It will glue iron to wood, and is used for that purpose in the manufacture of light buggies, the iron or steel axles being glued to their wooden beds so perfectly that the joint cannot be detected by the eye.
7. "Having great penetrating power it will take firm hold of very close-grained woods, or ivory, upon which other glues would have but little or no effect.
8. "It can be easily mixed with white lead for water-proof work, or with cattle glue for the purpose of improving the strength of the latter.
9. "Articles glued with it may be turned in a lathe, or otherwise worked, without dulling the tools, practical experiments having shown its superiority to cattle-glue in this respect to be as nine to one.
10. "But perhaps its most important peculiarity is that it does not set as quickly as cattle-glue, so that *work done with it can be*

USES OF FISH-GLUE—Continued.

carefully and deliberately adjusted to position without the necessity of heating the stock. Hence many kinds of work which were formerly extremely difficult if not impossible to perform perfectly are by the use of this glue rendered as easy and certain as ordinary painting. This property is found to be of special importance in the gluing of articles which cannot be heated, as the reed-boards of cabinet organs, large panels in the bodies of carriages, and in the interior finish of buildings and railway cars, and in all other places where cattle-glue would be likely to chill before the work could be got into position." (Circular of Russia Cement Company.)

24. SPONGES.

AMERICAN COMMERCIAL SPONGES.

Collection of Florida sponges: Glove sponge (*Spongia graminea*); sheep's-wool sponge (*Spongia equina*, subspecies *gossypina*); boat sponge (*Spongia equina*, subspecies *meandriniformis*); grass sponge (*Spongia equina*, subspecies *cerebriformis*); and yellow sponge (*Spongia agaricina*, subspecies *corlosia*, *dura*, and *punctata*).

(For list of specimens and information about the Florida sponge fishery, see Section B, "Collection of Economic Crustaceans Worms, Echinoderms, and Sponges.")

25. GELATINE.

PREPARED FROM IRISH MOSS (*Chondrus crispus*).

SPECIMENS OF IRISH MOSS (COMMERCIAL).

(*a*) Moss as it comes from the rocks; (*b*) moss partly bleached; (*c*) moss bleached for market. Scituate, Mass. 32,722. C. A. Cole.

26. OILS AND FATS.

MAMMAL OILS.

CRUDE SPERM OIL.

From sperm whale (*Physeter macrocephalus*). New York. 57,105. Collected by Jasper Pryer.

NATURAL SPERM OIL.

New York. 57,106. Collected by Jasper Pryer.

NATURAL "WINTER" SPERM OIL.

New Bedford, Mass. 35,546. I. H. Bartlett & Sons.

BLEACHED SPERM OIL.

New York. 57,107. Collected by Jasper Pryer.

BLEACHED "WINTER" SPERM OIL.

New Bedford, Mass. 24,895. George Delano & Co.

SPERMACETI.

Crude, black cake. New York. 57,110.

SPERMACETI, REFINED.

New York. 57,111. Collected by Jasper Pryer.

SPERMACETI CANDLES (size 4).

New York. 57,112. Collected by Jasper Pryer.

SPERM-OIL SOAP.

New York. 57,128. Collected by Jasper Pryer.

OIL OF RIGHT-WHALE (*Balæna* sp.).

New London, Conn. 25,055. Gift of Haven, Williams & Co.

OIL OF HUMPBACK WHALE (*Megaptera* sp.).

New York. 57,099. Collected by Jasper Pryer.

CRUDE ARCTIC WHALE OIL FROM BOWHEAD WHALE (*Balæna mysticetus*).

New York. 57,100. Collected by Jasper Pryer.

CRUDE SOUTHERN WHALE OIL FROM SOUTHERN RIGHT-WHALE (*Balæna* sp.).

New York. 57,101. Collected by Jasper Pryer.

NATURAL WHALE OIL.

New York. 57,102. Collected by Jasper Pryer.

NATURAL "WINTER" WHALE OIL.

New Bedford, Mass. 35,550. I. H. Bartlett & Sons.

BLEACHED WHALE OIL.

New York. 57,103. Collected by Jasper Pryer.

BLEACHED "WINTER" WHALE OIL.

New Bedford, Mass. 39,220. I. H. Bartlett & Sons.

EXTRA-BLEACHED WHALE OIL.

New York. 57,104. Collected by Jasper Pryer.

WHALE-OIL "FOOTS."

New York. 57,108. Collected by Jasper Pryer.

WHALE-OIL SOAP.

New York. 57,127. Collected by Jasper Pryer.

OIL OF SULPHUR-BOTTOM WHALE (*Sibbaldius* sp.).

New London, Conn. 25,056. Haven, Williams & Co.

OIL OF HARBOR SEAL (*Phoca vitulina*).

Provincetown, Mass. 25,979. Gift of Capt. N. E. Atwood. Used for lubricating.

OIL OF SEA-ELEPHANT (*Macrorhinus leonina*).

South Georgia Island, South Atlantic Ocean. 25,058. Gift of Haven, Williams & Co. Used for lubricating and for illumination.

BLEACHED SEA-ELEPHANT OIL (*Macrorhinus leonina*).

New York. 39,274. Collected by Jasper Pryer. Used for lubricating and for illumination.

NATURAL "WINTER" SEA-ELEPHANT OIL (*Macrorhinus leonina*).

New Bedford, Mass. 35,548. U. S. Fish Commission. For lubricating and illumination.

BLEACHED "WINTER" SEA-ELEPHANT OIL (*Macrorhinus leonina*).

New Bedford, Mass. 35,549. U. S. Fish Commission. For lubricating and illumination.

OIL FROM HEAD OF GRAMPUS (*Grampus griseus*).

Extracted by exposure to the sun. Provincetown, Mass. 25,733. Gift of E. E. Small. Used for lubricating fine machinery.

PRESSED OIL OF GRAMPUS (*Grampus griseus*).

Provincetown, Mass. 25,737. Gift of E. E. Small. Used for lubricating fine machinery.

OIL OF BELUGA (*Delphinapterus catodon*).

New Bedford, Mass. 26,038. U. S. Fish Commission.

OIL OF PORPOISE (*Lagenorhynchus leucopleurus*).

Extracted by exposure to the sun. Provincetown, Mass. 25,738. Gift of E. E. Small.

OIL OF COWFISH.

Provincetown, Mass. 25,967. Gift of Capt. N. E. Atwood.

JAW-OIL OF BLACKFISH (*Globicephalus melas*).

Provincetown, Mass. 26,066. Gift of Capt. Caleb Cook. For lubricating fine machinery.

HEAD-OIL OF BLACKFISH (*Globicephalus melas*).

Sold as "Porpoise jaw oil." Provincetown, Mass. 25,984. Gift of Capt. N. E. Atwood.

REFINED OIL OF BLACKFISH (*Globicephalus melas*).

New York. 57,109. Collected by Jasper Pryer.

OIL OF BLACKFISH (*Globicephalus melas*).

Refined, for preparing morocco. Gloucester, Mass. A W. Dodd & Co.

WATCH-OIL.

Provincetown, Mass. 39,458. Gift of Capt. Caleb Cook.

CLOCK-OIL.

Provincetown, Mass. 39,459. Gift of Capt. Caleb Cook.

OIL OF SNUFFER (*Phocæna americana*).

Extracted by exposure to the sun. Provincetown, Mass. 25,739. Gift of E. E. Small.

OIL OF HARBOR PORPOISE (*Phocæna americana*).

Eastport, Me. 26,037. Gift of George H. Peabody.

REPTILE OILS.

OIL OF ALLIGATOR (*Alligator mississippiensis*).

Harden, Jacksonville, Fla. 24,898. Gift of Dr. W. H. Babcock.

MOLLUSK OILS.

OIL OF SQUID (*Ommastrephes illecebrosa*).

Provincetown, Mass. 25,972. Gift of Capt. N. E. Atwood.

FISH OILS.

MENHADEN OIL AND ITS PRODUCTS.

(Prepared from menhaden (*Brevoortia tyrannus*) and used in currying leather, in rope-making, for lubricating, for adulterating linseed-oil, as a paint-oil, and exported to Europe for use in the manufacture of soap and for smearing sheep.)

OIL OF MENHADEN.

Samples of pure menhaden oil. Milford, Conn. The George W. Miles Company.

OIL OF MENHADEN.

Two qualities of menhaden oil. Baltimore, Md. Winfield S. Dunan.

OIL OF MENHADEN.

Cold-pressed for tanners' and curriers' use. Gloucester, Mass. A. W. Dodd & Co.

CRUDE MENHADEN OIL.

Brown-colored. New York. 57,118. Collected by Jasper Pryer.

CRUDE MENHADEN OIL.

Light-colored. New York. 57,116. Collected by Jasper Pryer.

CRUDE MENHADEN OIL.

Extra light-colored. New York. 57,122. Collected by Jasper Pryer.

PRESSED MENHADEN OIL.

Brown-colored. New York. 57,119. Collected by Jasper Pryer.

PRESSED MENHADEN OIL.

Light-colored. New York. 57,117. Collected by Jasper Pryer.

PRESSED MENHADEN OIL.

Extra light-colored. New York. 57,123. Collected by Jasper Pryer.

BLEACHED MENHADEN OIL.

New York. 57,120. Collected by Jasper Pryer.

EXTRA BLEACHED MENHADEN OIL.

New York. 57,121. Collected by Jasper Pryer.

MENHADEN OIL "FOOTS," UNBLEACHED.

New York. 57,115. Collected by Jasper Pryer.

BLEACHED MENHADEN OIL PRESSINGS.

New York. 57,124. Collected by Jasper Pryer.

EXTRA BLEACHED MENHADEN-OIL PRESSINGS.

New York. 57,125. Collected by Jasper Pryer.

MENHADEN-OIL SOAP.

New York. 57,129. Collected by Jasper Pryer.

STEARINE.

Prepared from oil of menhaden for tanners' and soapmakers' use.
Gloucester, Mass. A. W. Dodd & Co.

OTHER FISH OILS.

OIL OF MACKEREL (*Scomber scombrus*).

Provincetown, Mass. 26,979. Gift of Capt. N. E. Atwood.

OIL FROM LIVER OF MACKEREL-SHARK (*Isuropsis dekayi*).

Provincetown, Mass. 25,980. Gift of Capt. N. E. Atwood.

OIL FROM LIVER OF THRESHER-SHARK (*Alopias vulpes*).

Provincetown, Mass. 25,975. Gift of Capt. N. E. Atwood.

OIL FROM LIVER OF DOG-FISH (*Squalus acanthias*).

New York. 57,126. Collected by Jasper Pryer.

OIL OF SKATE (*Raia* sp.).

Provincetown, Mass. 26,980. Gift of Capt. N. E. Atwood.

OIL FROM LIVERS OF SUN-FISH (*Mola rotunda.*)

Extracted by exposure to the sun. Provincetown, Mass. 25,734. Gift of E. E. Small.

OIL FROM LIVER OF CRAMP-FISH (*Torpedo occidentalis*).

Provincetown, Mass. 25,976. Gift of Capt. N. E. Atwood.

OIL OF SWORD-FISH (*Xiphias gladius*).

Provincetown, Mass. 26,978. Gift of Capt. N. E. Atwood.

COD OIL.

Made from livers of cod (*Gadus morrhua*). Prepared for tanners' and curriers' use in dressing leather. (1) Newfoundland brand. (2) Labrador brand. (3) Grand Bank brand. (4) Shore brand. Gloucester, Mass. A. W. Dodd & Co.

STEARINE.

Made from cod oil for tanners' and soapmakers' use. Gloucester, Mass. A. W. Dodd & Co.

OIL OF HORSE-MACKEREL (*Orcynus thynnus*).

Provincetown, Mass. 25,973. Gift of Capt. N. E. Atwood.

OIL OF HALIBUT (*Hippoglossus vulgaris*).

Provincetown, Mass. 26,981. Gift of Capt. N. E. Atwood.

HALIBUT OIL.

Made from heads of halibut (*Hippoglossus vulgaris*). Gloucester, Mass. A. W. Dodd & Co.

CURRIERS' COD LIVER OIL.

New York. 57,113. Collected by Jasper Pryer.

COD-LIVER OIL.

Pure cod-liver oil for medicinal use. "This oil is steam-rendered by the best process known, from fresh and healthy cod livers, and warranted perfectly pure." Gloucester, Mass. A. W. Dodd & Co.

MEDICINAL OIL.

Prepared from livers of cod (*Gadus morrhua*). New York. 57,114. Collected by Jasper Pryer.

OIL FROM LIVER OF HADDOCK (*Melanogrammus æglefinus*).

Provincetown, Mass. 25,978. Gift of Capt. N. E. Atwood.

OIL FROM LIVER OF HAKE (*Phycis chuss*).

Extracted by exposure to the sun. Provincetown, Mass. 25,736. Gift of E. E. Small.

OIL FROM LIVER OF POLLOCK (*Pollachius carbonarius*).

Extracted by exposure to the sun. Provincetown, Mass. 25,740. Gift of E. E. Small.

OIL FROM LIVER OF CUSK (*Brosmius brosme*).

Provincetown, Mass. 25,970. Gift of Capt. N. E. Atwood.

CRUDE OULACHON OIL.

From oulachon or candle-fish (*Thaleichthys pacificus*). Port Townsend, Washington Territory, 1882. 55,415. Collected by J. G. Swan.

OULACHON OIL.

From oulachon or candle-fish (*Thaleichthys pacificus*). Port Townsend, Washington Territory, 1879. 32,778. Collected by J. G. Swan.

OIL OF STURGEON (*Acipenser* sp.).

One pint bottle. New York. Albany Beef Packing Company, 372 Greenwich street. "This is made by an entirely new process, which produces it in a very fine and clear state, and is used in large quantities by tanneries, belting-factories, &c." (*Richard Weinacht*, secretary.)

27. PERFUMES.

MAMMAL PERFUMES.

AMBERGRIS OF SPERM-WHALE.

Commercial ambergris, with specimens of ambreine. Boston, Mass. 39,376. Weeks & Potter.

28. CHEMICAL PRODUCTS AND AGENTS EMPLOYED IN THE ARTS AND MEDICINE.

DERIVED FROM PLANTS.

BLADDER-WRACK.

Fluid extract sea-wrack (*Fucus vesiculosus*). Used for reducing morbid obesity or excessive fatness. Philadelphia, Pa. John Wyeth & Brother.

DERIVED FROM FISH.

ALBUMEN.

Prepared from eggs of cod and other fish. Osterville, Mass. United States Albumen Manufacturing Company. Uno H. Hillman, superintendent.

29. FERTILIZERS.

FISH GUANOS.

GUANO.

Made from waste skins and bones of cod, cusk, hake, &c.

1. "Guano manufactured from salt fish, and bones, waste that has been removed in preparing boneless fish for the market. In 1882 there were 3,000 tons of this waste; it had a market value of $12 per ton. According to an analysis by S. P. Sharples, United States assayer, this guano contains: Phosphoric acid, 9.67 per cent.; equal to bone phosphate, 21.10 per cent.; nitrogen, 8.45 per cent.; equal to ammonia, 10.26 per cent.; moisture, 5.30 per cent.
2. "Guano from skins of cod and cusk, after the glue has been removed. According to an analysis by S. P. Sharples, United States assayer, this guano contains: Phosphoric acid, 9.38 per cent.; equal to bone phosphate, 20.47 per cent.; nitrogen, 8.12 per cent.; equal to ammonia, 9.86 per cent.; moisture, 5.23 per cent.
3. "Guano from pollock skins and scales, after the glue has been removed. According to an analysis by S. P. Sharples, United States assayer, this guano contains: Phosphoric acid, 15.82 per cent.; equal to bone phosphate, 34.53 per cent.; nitrogen, 8.65 per cent.; equal to ammonia, 10.50 per cent.; moisture, 6.29 per cent.
4. "Guano from halibut heads, after the oil has been removed. According to an analysis by S. P. Sharples, United States assayer, this guano contains: Phosphoric acid, 12.89 per cent.; equal to bone phosphate, 27.14 per cent.; nitrogen, 5.29 per cent.; equal to ammonia, 6.42 per cent.; moisture, 5.11 per cent.
5. "Guano from fresh fish heads after the glue has been removed. According to an analysis by S. P. Sharples, United States assayer, this guano contains: Phosphoric acid, 20.22 per cent.; equal to bone phosphate, 44.14 per cent.; nitrogen, 6.52 per cent.; equal to ammonia, 7.91 per cent.; moisture, 3.48 per cent." (*J. S. Rogers.*) Gloucester, Mass. Gloucester Isinglass and Glue Company.

FISH-GUANO.

Prepared from cooked skins of cod and cusk after the glue has been pressed out. Gloucester, Mass., 1882. 56,921. Russia Cement Company.

GUANO FROM MENHADEN (*Brevoortia tyrannus*).

1. "George W. Miles's I. X. L. ammoniated bone superphosphate, containing ammonia 3 to 5 per cent.; available phosphoric acid, 10 to 12 per cent.; potash, 2 to 4 per cent.; ammonia, produced from fish.
2. "Miles's patented ammoniated superphosphate, containing ammonia, 2½ to 3½ per cent.; available phosphoric acid, 8 to 10 per cent.; potash, 1 to 3 per cent.; ammonia, produced from fish.
3. "George W. Miles's patented acid fish, No. 1, containing ammonia, 10 to 12 per cent.; available phosphoric acid, 4 to 6 per cent. This is fish fresh from the presses, treated with acid.
4. "Miles's patented acid fish, No. 2, containing ammonia, 9 to 11 per cent.; available phosphoric acid, 4 to 6 per cent. This is fish after passing through a sweating process, treated with acid.
5. "George W. Miles's patented C. Island guano, No. 1, containing ammonia, 10 to 12 per cent.; bone phosphate of lime, 14 to 17 per cent. This is fish fresh from the presses, dried in steam dryers.
6. "Miles's C. Island guano, No. 2, ammonia, 8 to 10 per cent.; bone phosphate of lime, 10 to 12 per cent. This is fish dried in steam dryers after passing through a sweating process.
7. "Pure dried fish, No. 1, containing ammonia, 10 to 12 per cent.; bone phosphate of lime, 9 per cent. This is fish fresh from the presses, dried on platforms and ground.
8. "Pure dried fish, No. 2, containing ammonia, 10 to 12 per cent.; bone phosphate of lime, 9 per cent. This is fish fresh from the presses, dried on platforms, unground.
9. "Miles's ammoniated dissolved bone, ammonia, 2 to 3 per cent.; 7 to 9 per cent. phosphoric acid; ammonia, from fish.
10. "Miles's dissolved black, containing 36 per cent. bone phosphate of lime; burnt bone dissolved in acid.
11. "Miles's acid phosphate, containing 25 per cent. bone phosphate of lime.
12. "George W. Miles's ammoniated acid phosphate, containing 3 per cent. of ammonia, 22 per cent. bone phosphate of lime; ammonia, produced from fish.
13. "Pure rock phosphate, 60 per cent. bone phosphate of lime.
16. "Miles's fish and potash, No. 1; ammonia, 4 to 6 per cent.; available phosphoric acid, 5 to 8 per cent.; potash, 4 to 6 per cent.
17. "Miles's fish and potash, No. 2; ammonia, 3 to 5 per cent.; available phosphoric acid, 5 to 8 per cent.; potash, 4 to 6 per cent."

Milford, Conn. The George W. Miles Company.

GUANO FROM MENHADEN (*Brevoortia tyrannus*).

1. Dry fish-scrap. "Percentages: Ammonia, 10½ per cent.; bone phosphate of lime, 15 per cent."

GUANO FROM MENHADEN—Continued.

2. Dry ground fish-guano. "Percentages: Ammonia, 10½ per cent.; bone phosphate of lime, 15 per cent."
3. Fish and potash (ammoniated with fish). "Percentages: Ammonia, 5 per cent.; bone phosphate of lime, 12 per cent.; available phosphoric acid, 5 per cent.; potash, 5 per cent."
4. Superphosphate (ammoniated with fish). "Percentages: Ammonia, 3 per cent.; bone phosphate of lime, 25 per cent.; available phosphoric acid, 10 per cent.; potash, 2½ per cent."

New London, Conn. Quinnipiac Fertilizer Company.

GUANO FROM MENHADEN (*Brevoortia tyrannus*).

1. Unground or crude menhaden scrap; made of fish two years old and over, called large fish.
2. Ground menhaden scrap; made from the same stock as No. 1.
3. Unground or crude menhaden scrap; made of fish not over one year old, called small fish.
4. Ground menhaden scrap; made of same stock as No. 3.

Baltimore, Md. Winfield S. Dunan.

MENHADEN SCRAP OR GUANO.

1. Unground or crude scrap. 2. Fine-ground scrap. 3. Very fine-ground scrap. New Bedford, Mass. W. A. Abbe.

ARTIFICIAL GUANO.

Series of preparations used in the manufacture of Soluble Pacific Guano:

1. Crude menhaden scrap. 2. Dried and ground menhaden scrap. 3. Muriate of potash. 4. Nitrate of soda. 5. Crude South Carolina phosphate. 6. Crushed South Carolina phosphate. 7. Ground South Carolina phosphate. 8. Sicily sulphur. 9. Stassfurth kainite. 10. Soluble Pacific guano, unscreened. 11. Soluble Pacific guano, screened. Wood's Holl, Mass. Soluble Pacific Guano Company.

FISH-GUANO.

Made from menhaden (*Brevoortia tyrannus*) after the oil has been extracted. Gloucester, Mass. A. W. Dodd & Co.

FISH-GUANO.

Made from heads of halibut (*Hippoglossus vulgaris*) after the oil has been extracted. Gloucester, Mass. A. W. Dodd & Co.

FISH-GUANO.

Made from refuse resulting from the manufacture of fish oils. Gloucester, Mass. A. W. Dodd & Co.

FISH-GUANO.

Prepared from sturgeon (*Acipenser* sp.). Samples of pure sturgeon guano; also, 50 per cent. and 75 per cent. sturgeon guano mixed with other ingredients. New York. Albany Beef Packing Company, 372 Greenwich street.

GREAT INTERNATIONAL FISHERIES EXHIBITION.

LONDON, 1883.

UNITED STATES OF AMERICA.

L.

CATALOGUE

OF THE

FISH-CULTURAL EXHIBIT

OF THE

UNITED STATES FISH COMMISSION.

BY

R. EDWARD EARLL,

CURATOR OF THE FISHERIES COLLECTIONS, U. S. NATIONAL MUSEUM,
AND ASSISTANT, U. S. FISH COMMISSION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

TABLE OF CONTENTS.

A.—INTRODUCTION.

Page.

Historical sketch of fish-culture in the United States 5

B.—INVESTIGATION.*

I.—Commissions and societies engaged in the investigation of questions relating to fish-culture.

1. Portraits and photographs of prominent fish-culturists 20
United States Fish Commissioner 20
State fish commissioners 20
Members of American Fish-Cultural Association 21
Private fish-culturists 22

II.—Results of inquiry.

2. Publications 22
Publications of the U. S. Fish Commission 22
Publications of the State fish commissions 26
Publications of the American Fish-Cultural Association 36
Publications of private fish-culturists 37
3. Collections 37
Spermaries and ovaries of important food-fishes, illustrating the time and place of spawning 37

C.—PROTECTION.

III.—Legislation.

4. Fishery laws 47

IV.—Assistance to fish in reaching their spawning-grounds.

5. Fish-ways or ladders 47
Pool fish-ways 47
Chute or trough fish-ways 48
Deflected current fish-ways 49
Counter-current fish-ways 52

V.—Purification of streams.

6. Cleansing residuum from manufacturing establishments, &c 53

---

*For apparatus employed in scientific research see Sec. G.

D.—ARTIFICIAL PROPAGATION.

VI.—Apparatus for the manipulation of eggs and young fish.

	Page.
7. Hatching apparatus and accessories	54
Apparatus for heavy eggs—trough apparatus	54
Apparatus for semi-buoyant eggs	57
Apparatus for adhesive eggs	62
Apparatus for floating eggs	63
Hatching and rearing establishments	64
Accessories to hatching apparatus	74
8. Transportation apparatus and accessories	77
Apparatus for carrying fry	77
Apparatus for carrying spawning fish	81
Apparatus for carrying eggs	82
Accessories used in transporting eggs and live fish	85
9. Models and photographs illustrative of the history and methods of fish-culture	86

VII.—Results of fish-culture.

10. Collections illustrating the growth of fish, &c	91
Eggs showing the growth of embryos	91
Fish showing the growth of fry	92
Hybrid fishes	93
Acclimatization of fishes	93
11. Statistics of fish-culture	93
12. Literature of fish-culture	93

A.—INTRODUCTION.

HISTORICAL SKETCH OF FISH-CULTURE IN THE UNITED STATES.

As the United States is the acknowledged leader among nations in all questions relating to fish-culture, it seems proper, in presenting the catalogue of the fish-cultural exhibit at the London Fisheries Exhibition, to give a brief outline of the origin and growth of the science in this country and of the more important changes in methods and improvements in apparatus that have taken place from time to time.

The first attempt at artificial fish-culture in the United States was made in 1851, when Dr. Theodatus Garlick, of Cleveland, Ohio, took and impregnated eggs of the brook trout, *Salvelinus fontinalis*, which he placed in a wooden trough, the bottom of which was covered with gravel. This trough was supplied with pure, cold spring-water, and the eggs placed upon the gravel, where they were allowed to remain until hatched. When the news of Dr. Garlick's success became known considerable interest in the subject sprang up in many quarters, and numerous experiments were made with eggs of the trout and other species. In 1856 public sentiment had developed sufficiently to warrant the Massachusetts legislature in establishing a Board of Commissioners for investigating subjects relating to the fisheries and considering the practicability of the artificial propagation of fish at the expense of the State. In 1865 another board was appointed to report upon the obstructions to the ascent of fish in the Connecticut River. Private individuals also interested themselves in similar investigations, and numerous experiments were made in the hatching and rearing of young fish, but these were for the most part limited and of little commercial importance.

The era of practical fish-culture was inaugurated in 1864 by Mr. Seth Green, who built a hatchery and engaged extensively in the artificial propagation of several species. A year later the New Hampshire fish commission was formed, and an attempt was made, at the expense of the State, to restock the salmon rivers, this being the first appropriation of public money for fish-cultural purposes. The same year a fish commission was established in the neighboring State of Vermont, and a permanent commission was formed in Massachusetts, together with similar commissions in Connecticut and Pennsylvania. Other States soon followed the example of those already mentioned, Maine establishing its commission in 1867, followed by New York and Rhode Island in 1868, and by New Jersey and the distant State of California in 1870.

The reports of several of the commissions already established pointed to a rapid diminution in the fish supply of New England, owing to immoderate fishing, the obstruction of river channels by dams and the pollution of the waters by the manufacturing establishments along their

banks. These reports were widely circulated and caused general public interest in the matter, Congress being called upon to investigate the subject. As a result, the United States Fish Commission was established in 1871, with Prof. Spencer F. Baird, then Assistant Secretary of the Smithsonian Institution, at its head, with instructions to investigate the question of the alleged decrease and report whether any protective measures were advisable. The establishment of this Commission marks a new era in the fish-culture of the country, and its operations, which have been increasing from year to year, are more extensive than those of any other similar organization in the world.

The same year Alabama and Utah established fish commissions, and in 1873 commissions were formed in Michigan, Ohio, and Wisconsin. In 1874, the legislatures of Iowa, Maryland, Minnesota, and Virginia were induced to create commissions in their respective States. Illinois followed their example in 1875, and Arkansas, Georgia, and Kentucky a year later. The year 1877 was a remarkable one in the history of State fish commissions, as it witnessed the organization of eight new ones, namely, those of Colorado, Kansas, Missouri, Nevada, North Carolina, Tennessee, Washington Territory, and West Virginia. In 1878 a State commission of fisheries was organized in South Carolina, and similar ones were formed in Nebraska, Wyoming, and Texas in 1879, in Oregon, in 1880, and in Arizona, Delaware, and Indiana in 1881.

The present public interest in the subject is indicated by the fact that only seven States and Territories of our entire number are now without commissions. A better test of public confidence is found in the annually increasing appropriations which are made for fish-cultural work by the General Government and by the governments of the several States. Below are tables showing the annual appropriations for the several State commissions and for the United States Commission:

Appropriations for the work of the State fish commissions from their origin down to, and including, the year 1882.

State.	Years for which appropriations were made.	Amount appropriated to 1882, inclusive.	State.	Years for which appropriations were made.	Amount appropriated to 1882, inclusive.
Alabama	.....	.....	New Hampshire	1866–1882	$26,463
Arizona	1881,1882	$500	New Jersey	1872–1881	33,500
Arkansas	.....	.....	New York	1868–1882	210,000
California	1870–1882	52,000	North Carolina	1881–1882	11,226
Colorado	1877–1882	11,650	Ohio	1873–1882†	39,000
Connecticut	1868–1882	53,300	Oregon	.....	.....
Delaware	1881–1882	300	Pennsylvania	1873–1882	114,630
Georgia	1876–1882	3,500	Rhode Island	1870–1882‡	11,500
Illinois	1880–1882	5,500	South Carolina	1879–1882§	6,242
Indiana	1881–1882	2,000	Tennessee	.....	.....
Iowa	1874–1882	32,450	Texas	1882	5,000
Kansas	1877–1882*	3,000	Utah	1882	850
Kentucky	1876–1882	13,500	Vermont	1867–1882	10,800
Maine	1867–1882†	46,975	Virginia	1875–1882	21,500
Maryland	1874–1882	96,500	Washington	.....	.....
Massachusetts	1866–1882	95,500	West Virginia	1877–1882	8,100
Michigan	1873–1882	68,500	Wisconsin	1873–1882	52,860
Minnesota	1874–1882	32,500	Wyoming	1880–1882	2,350
Missouri	1877–1882	14,000			
Nebraska	1879–1882	8,400	Total	.....	1,101,096
Nevada	1877–1882	7,000			

* Except 1881. † Except 1879. ‡ Except 1877, 1878, 1879, and 1882. § Except 1880.

Appropriations for the work of the United States Fish Commission, 1871–'83.

Fiscal year.	Inquiry.	Propagation.	Hatcheries and ponds.	Steam vessels.	Miscellaneous.	Total.
1871–'72	$8,500	.....	.....	.....	.....	$8,500 00
1872–'73	5,000	$25,000	.....	.....	$500	30,500 00
1873–'74	5,000	32,500	.....	.....	1,000	38,500 00
1874–'75	5,000	17,500	.....	.....	1,000	23,500 00
1875–'76	5,000	65,000	.....	.....	1,000	71,000 00
1876–'77	5,000	30,045	.....	.....	1,000	36,045 00
1877–'78	.....	67,500	$2,200 00	.....	1,000	70,700 00
1878–'79	.....	70,000	5,000 00	.....	1,000	76,000 00
1879–'80	3,500	90,000	5,000 00	$57,500	1,000	157,000 00
1880–'81	3,500	85,000	17,000 00	15,000	1,000	121,500 00
1881–'82	3,500	130,000	20,001 45	172,709	2,500	328,710 45
1882–'83	3,500	115,000	30,000 00	70,000	10,500	229,000 00
Total	47,500	727,545	79,201 45	315,209	21,500	1,190,955 45

An examination of these tables shows a total of $2,292,051.45 of public money appropriated for fish-cultural work since 1865. This, by no means, represents the entire amount of money expended in fish-cultural work, as private funds are invested in fish-culture in many localities and large sums are expended annually in establishing and maintaining hatcheries and in preparing ponds for the reception of carp and other species, which are now being raised for sale in the markets.

The work of the different commissions is by no means limited to the artificial propagation of food-fishes, a wiser and broader policy having been adopted, including a thorough investigation of the waters and their inhabitants, together with kindred subjects that have a practical bearing on the food and habits of fish life. The success of fish-culture in the United States is largely due to the fact that it is under the direction of men of acknowledged scientific ability, who are not contented with any superficial investigations, and will not be satisfied until they have reached the bottom facts.

As the United States Fish Commission has been the leader in the fish-culture of America, a somewhat full description of its aims and methods seems desirable. No better statement of these can be found than that given by Mr. G. Brown Goode, in his paper on the fishery industries of the United States, read before the conference of the London Fisheries Exhibition.*

"On the 9th of February, 1871, Congress passed a joint resolution which authorized the appointment of a Commissioner of Fish and Fisheries. The duties of the Commissioner were thus defined: 'To prosecute investigations on the subject [of the diminution of valuable fishes] with the view of ascertaining whether any and what diminution in the number

* A Review | of the | Fishery Industries | of | the United States | and the Works of the U. S. Fish Commission | by | G. Brown Goode, M. A. | Assistant Director of the United States National Museum | and | Commissioner to the International Fisheries | Exhibition, London, 1883 | —— | Read at a conference of the International Fisheries | Exhibition, June 25, 1883 | His Excellency James Russell Lowell in the chair | —— | London | William Clowes and Sons, Limited | International Fisheries Exhibition | and 13 Charing Cross, S. W. | 1883.

of the food-fishes of the coast and the lakes of the United States has taken place; and, if so, to what causes the same is due; and also whether any and what protection, prohibitory or precautionary measures should be adopted in the premises, and to report upon the same to Congress.'

"The resolution establishing the office of Commissioner of Fisheries required that the person to be appointed should be a civil officer of the Government, of proved scientific and practical acquaintance with the fishes of the coast, to serve without additional salary. The choice was thus practically limited to a single man for whom, in fact, the office had been created. Prof. Spencer F. Baird was appointed and entered at once upon his duties.

"I think I may say without fear of challenge that very much of the improvement in the condition of our fisheries has been due to the wise and energetic management of our Commissioner. Himself an eminent man of science, for forty years in the front rank of biological investigation, the author of several hundred scientific memoirs, no one could realize more thoroughly the importance of a scientific foundation for the proposed work.

"His position as the head of that most influential scientific organization, the Smithsonian Institution, given by an Englishman to the United States 'for the increase and diffusion of knowledge among men,' enabled him to secure at once the aid of a body of trained specialists.

"Pure and applied science have labored together always in the service of the Fish Commission, their representatives working side by side in the same laboratories; indeed, much of the best work both in the investigation of the fisheries and in the artificial culture of fishes has been performed by men eminent as zoologists.

* * * * * * *

"The work of the Commission is naturally divided into three sections:

"1. The systematic investigation of the waters of the United States and the biological and physical problems which they present. The scientific studies of the Commission are based upon a liberal and philosophical interpretation of the law. In making his original plans the Commissioner insisted that to study only the food-fishes would be of little importance, and that useful conclusions must needs rest upon a broad foundation of investigations purely scientific in character. The life history of species of economic value should be understood from beginning to end, but no less requisite is it to know the histories of the animals and plants upon which they feed or upon which their food is nourished; the histories of their enemies and friends, and the friends and foes of their enemies and friends, as well as the currents, temperatures, and other physical phenomena of the waters in relation to migration, reproduction, and growth. A necessary accompaniment to this division is the amassing of material for research to be stored in the National and other museums for future use.

"2. The investigation of the methods of fisheries, past and present, and the statistics of production and commerce of fishery products. Man being one of the chief destroyers of fish, his influence upon their abundance must be studied. Fishery methods and apparatus must be examined and compared with those of other lands, that the use of those which threaten the destruction of useful fishes may be discouraged, and that those which are inefficient may be replaced by others more serviceable. Statistics of industry and trade must be secured for the use of Congress in making treaties or imposing tariffs, to show to producers the best markets and to consumers where and with what their needs may be supplied.

"3. The introduction and multiplication of useful food-fishes throughout the country, especially in waters under the jurisdiction of the General Government, or those common to several States, none of which might feel willing to make expenditures for the benefit of the others. This work, which was not contemplated when the Commission was established, was first undertaken at the instance of the American Fish-Cultural Association, whose representatives induced Congress to make a special appropriation for the purpose. This appropriation has since been renewed every year on an increasingly bountiful scale, and the propagation of fish is at present by far the most extensive branch of the work of the Commission, both in respect to number of men employed and quantity of money expended.

* * * * * * *

"Since the important sea-fisheries are located along the North Atlantic, the coast of this district has been the seat of the most active operations in marine research. For twelve years the Commissioner, with a party of specialists, has devoted the summer season to work at the shore, at various stations along the coast from North Carolina to Nova Scotia.

"A suitable place having been selected, a temporary laboratory is fitted up with the necessary appliances for collection and study. In this are placed from ten to twenty tables, each occupied by an investigator—either an officer of the Commission or a volunteer.

"The regular routine of operations at a summer station includes all the various forms of activity known to naturalists—collecting along the shore, seining upon the beaches, setting traps for animals not otherwise to be obtained, and scraping with dredge and trawl the bottom of the sea, at depths as great as can be reached by a steamer in a trip of three days. In the laboratory are carried on the usual structural and systematic studies, the preparation of museum specimens and of reports.

"The permanent headquarters are located at Wood's Holl, Mass., where wharves are being built for the accommodation of the fleet of the Commission, and a house for use as scientific and fish-cultural lab-

oratories, and where the propagation of sea-fishes will be continued on a larger scale than heretofore.

"In addition to what has been done at the summer station, more or less exhaustive investigations have been carried on by smaller parties in every important position of the coast and interior waters.

"For several years steamers were lent for the work by the Secretary of the Navy and the Coast Survey and Revenue Services.

"In 1880, however, a steamer of 450 tons, the Fish Hawk, was built for the Commission. This being needed for fish-hatching purposes, another larger steamer, of 1,000 tons, the Albatross, has just been built and put into commission. She has already, since April, made two successful deep-sea explorations, and has been supplied with every means for work of this kind.

"The general practical results of this part of the work cannot be satisfactorily summed up on account of the number of important investigations still in progress.

"One of the important features of the work has been the preparation of life histories of the principal fishes, great quantities of material having been accumulated relating to almost every species. A portion of this has been published, biographical monographs having been published on the bluefish, the scup, the menhaden, the salmon, the whitefish, the shad, the mackerel, the swordfish; and others are being printed.

"Similar monographs upon the lobster, oyster, and other invertebrates are also ready.

"In connection with the work of fish-culture much attention has been paid to embryology. The breeding times and habits of nearly all of our fishes have been studied, and their relations to water temperatures. The embryological history of a number of species, such as the cod, shad, alewife, salmon, smelt, Spanish mackerel, striped bass, white perch, the silver gars, the clam, and the oyster, have been obtained under the auspices of the Commission.

"Many other problems have been worked out by specialists for the Commission, the details of which are described in the reports. One of these, for instance, has been the determination of the cause of the reddening of salt codfish, so injurious to commerce. Professor Farlow found this to be due to the presence of a species of alga in the kind of salt in common use, and gave instructions by which the plague has been greatly lessened.

"An investigation into the chemical composition and nutritive value of fish as compared with other food is still in progress, and all American food-fishes are being analysed by Professor Atwater.

"The temperature of the water in its relation to the movements of fish, has from the first received special attention. Observations are made regularly during the summer work and at the various hatching stations. At the instance of the Commissioner an extensive series of observations have for several years been made under the direction of

the Chief Signal-Officer of the Army at light-houses, light-ships, life-saving and signal stations, carefully chosen, along the whole coast. A number of fishing schooners and steamers have kept similar records. One practical result of the study of these observations has been the demonstration of the cause of the failure of the menhaden fisheries on the coast of Maine in 1879; a failure on account of which nearly 2,000 persons were thrown out of employment.

"A most remarkable series of contributions have been received from the fishermen of Cape Ann. When the Fish Commission had its headquarters at Gloucester, in 1878, a general interest in the zoological work sprang up among the crews of the fishing vessels, and since that time they have been vying with each other in efforts to find new animals. Their activity has been stimulated by the publication of lists of their donations in the local papers; and the number of separate lots of specimens received to the present time exceeds eight hundred. Many of these lots are large, consisting of collecting-tanks full of alcoholic specimens. At least thirty fishing-vessels were carrying collecting-tanks on every trip, until it became necessary to recall them because no more specimens were required, and many of the fishermen, with characteristic superstition, had the idea that it insured good luck to have a tank on board, and would not go to sea without one. The number of specimens acquired in this manner is at least fifty or sixty thousand, most of them belonging to species otherwise unattainable. Each halibut vessel sets once or twice daily, lines from 10 to 14 miles in length, with hooks upon them 15 feet apart, in water 1,200 to 1,800 feet in depth, and the quantity of living forms brought up in this manner, and which had never hitherto been saved, is very astonishing. Over thirty species of fishes have thus been added to the fauna of North America, and Professor Verrill informs me that the number of new and extra limital forms thus placed upon the list of invertebrates cannot be less than fifty.

"The investigation of the statistics and history of the fisheries has perhaps assumed greater proportions than was at first contemplated. One of the immediate causes of the establishment of the Commission was the dissension between the line and net fishermen of Southern New England with reference to laws for the protection of the deteriorating fisheries of that region. The first work of Professor Baird as Commissioner was to investigate the causes of this deterioration.

"Each year increasing attention has been paid to this subject. The Commissioner has never advised any legislation on the part of the General Government, each State Government having control over the fisheries in its own waters.

* * * * * * *

"The statutes of the various States contain numerous laws for the protection of fish and fishermen generally worse than useless, though there are many definitions of close time which appear to be beneficial.

To enforce these laws would, however, render necessary a large force of fish wardens.

"The policy of the United States Commissioner has been to carry out the idea that it is better to expend a small amount of public money in making fish so abundant that they can be caught without restriction and serve as cheap food for the people at large, rather than to expend a much larger amount in preventing the people from catching the few that still remain after generations of improvidence."

The first experiments in fish-culture by Dr. Garlick were conducted in an ordinary trough filled with running water, the bottom being covered with gravel, so that the conditions might approximate as nearly as possible to the natural conditions of the river bed. As fish-culture has become more extensive experiments have been made in the artificial propagation of numerous other species, which have necessitated the invention of apparatus of an entirely different character.

The eggs thus far hatched may be referred to one of four classes, viz: (1) heavy eggs, (2) semi buoyant eggs, (3) adhesive eggs, and (4) floating eggs. Each of these classes requires apparatus adapted to itself, and that suited to one is frequently entirely unfit for another.

The apparatus for heavy eggs has numerous modifications, depending upon the direction of the current through the eggs. All of the older forms required a horizontal current, but the more recent ones have the eggs arranged in trays, one above the other, with the current passing either upward or downward through them.

Apparatus for semi-buoyant eggs has undergone considerable change. They were for a time hatched with fair success on trays with a downward current of water, but the use of this apparatus is now entirely discontinued. The present forms are floating boxes for utilizing river currents, submerged boxes for utilizing wave action, closed vessels for utilizing head or hydrant pressure, and mechanical apparatus. The third named is unquestionably the most satisfactory, as it is more economical and more convenient than the others. This form has undergone numerous modifications to make it automatic, and is now perfected so that the dead eggs pass off with the waste water and the young fish are collected in aquarium receivers.

Several forms of apparatus have been invented for adhesive eggs. The first were copied from Sweden, consisting of wooden boxes, protected by wire netting, containing twigs covered with eggs and placed in the open streams. The most important form consists of a wooden trough with glass plates placed transversely and extending entirely across it, fitting in grooves at the side, each alternate one being a little above the bottom of the trough, so that the current passes over the first, under the second, over the third, &c., on its way through the trough, thus furnishing a constant current around each plate. The eggs are placed upon the glass plates, which can be easily removed to be cleaned of any sediment that may have gathered upon them. No apparatus has

yet been invented for floating eggs that proves entirely satisfactory, though several forms are used with fair results. These are the floating box, arranged to utilize the action of the waves, a cylindrical hatching-can, made to revolve by means of machinery, and a modified form of the Clark hatching-trough.

Formerly, the work of any fish-cultural establishment was limited to the quantity of eggs obtained in the immediate vicinity, which were usually secured from fish kept in the ponds of the hatchery, or from those taken in the adjacent river. Later, boats were employed to enable the spawn-takers to go out among the net-fishermen, and, later still, steam-launches were introduced to enable them to visit more distant localities. Another plan, which has considerably reduced the expense of artificial propagation, has been the building of floating hatcheries, which can be towed to any given locality, and after the spawning season is over these can again be taken in tow and carried to a more northern fishing center to continue the work; thus the same hatchery and equipment can be employed in hatching eggs of the shad in Florida waters in January and February, on the Carolina coast in March and April, in the rivers of Maryland in May and June, and on the New England coast later in the season.

Within the past few years satisfactory experiments have been made in securing eggs and shipping them either by rail or steamer to hatching stations quite remote from the fishing grounds. This plan has long been applied to the eggs of certain species of *Salmonidæ*, but it is only recently that it has been employed with the eggs of the shad. Men are now sent with a camping and collecting outfit to the different fishing stations along the river banks, with rations to last them during the fishing season, their duty being to examine the fish at each haul of the seine, secure such eggs as may be obtained, and put them on board the river steamer for shipment to the hatching station. In this way the expense of the work has been greatly reduced. Another plan of increasing the quantity of eggs for any particular hatchery is to build pens capable of holding considerable numbers of fish. For some years the practice of the U. S. Fish Commission was to visit the nets of the fishermen and take the eggs from such females as chanced to be in proper condition, a very large proportion of the fish being either spent or too immature to enable the eggs to be impregnated. Numbers of eggs were lost in this way, and it was found expedient to collect the fish and pen them until they should ripen, when the eggs could be secured. Different plans are adopted to accomplish this purpose. At Grand Lake Stream, where the land-locked salmon are hatched, net basins are constructed along the bank and netting is stretched across the stream when the salmon ascend to spawn. These nets or wings turn them into the basins, where they are retained until the spawning season arrives, when they can be examined from day to day and all the ripe eggs secured. In California the same end is ac-

complished by placing a dam across the river which prevents the fish from proceeding further. The fish thus remain in the vicinity of the dam until ripe, when they are secured by seines hauled by employés of the hatchery. At the whitefish hatcheries on the Great Lakes pounds have been constructed along the shore in which the fish have been retained for a few days until ripe, so that the entire number of eggs, or a large percentage of them, can be impregnated. The penning of fish, especially in summer, often results in great loss, as some species are so restless when in confinement that they soon kill themselves by rushing against the barriers, or become so bruised that they fall an easy prey to fungus, which destroys great numbers of them. At one of the hatcheries in Canada the plan is adopted of penning the fish in salt water, which entirely does away with the danger from the fungus, as it never makes its appearance in salt water.

The spawning season of any particular species in a given locality usually lasts but a few weeks, and for this reason a large force of men has been required for a short time in taking and caring for the eggs and distributing the fish, after which the hatchery is closed for want of eggs. The plan of retarding eggs by means of refrigerators, in which they can be stored, promises to give good results. Mr. F. N. Clark, the superintendent of the Northville hatchery, informs me that his hatchery will accommodate scarcely more than a hundred millions of eggs; but as it is found desirable to hatch out larger quantities, a refrigerator is being erected, with an ice-chamber at the top and pipes running down to convey the air into the chamber beneath, which is to contain the eggs. These are to be spread on trays, placed one above another, with air-spaces between them. Here they will be kept until room occurs for them in the hatchery, one lot being taken from the refrigerator and hatched, while the rest remain to await their turn. He hopes to increase the capacity of his hatchery in this way from one hundred to five hundred millions, and believes that he will be enabled to distribute fish during at least four months, and to extend the hatching period by at least three months beyond its natural limit.

In the early stages of fish-culture in this country considerable difficulty was experienced in transporting fry from one locality to another, and the expense of such transportation was a serious item. The fry were usually placed in large cans, carried in the baggage-cars of passenger trains, two assistants usually accompanying every shipment, to change the water and keep it at a proper temperature. Cars constructed expressly for the purpose, with hotel accommodations for the messengers, are now employed by the United States Fish Commission. These are fitted with refrigerators, tanks, and water-pipes. Their use greatly reduces the difficulty and cost of transportation, as a car-load can now be taken as easily as a half dozen cans by the old method.

Fish-culture was for some years confined wholly to a few species, but of late the number has been considerably extended.

Until 1878 the work of the United States Commission was confined wholly to fresh-water and anadromous species. In this year, however, a station was established at Gloucester, Mass., for the propagation of of marine species; and cod, herring, and haddock were successfully hatched. In 1880 successful experiments were made with several food-fishes from our southern seaboard. The following is a list of the principal species artificially hatched in the United States, with the date when, and the person by whom, the experiments were first made:

1. Brook trout, *Salvelinus fontinalis*, by Dr. T. Garlick in 1851.
2. White-fish, *Coregonus clupeiformis*, by Müller and Brown in 1857.
3. Lake trout, *Salvelinus namaycush*, by Müller and Brown in 1857.
4. Pike perch, *Stizostedium americanum*, by Müller and Brown in 1857.
5. Atlantic salmon, *Salmo salar*, by J. B. Johnston in 1864.
6. Land-locked salmon, *Salmo salar*, subsp. *sebago*, by Robinson and Hoyt in 1867.
7. Shad, *Clupea sapidissima*, by Seth Green in 1867.
8. California salmon, *Oncorhynchus chouicha*, by Livingston Stone in 1872.
9. Striped bass, *Roccus striatus*, by M. G. Holton in 1873.
10. Oquassa trout, *Salvelinus oquassa*, by C. G. Atkins in 1874.
11. Sea bass, *Centropristis nigricans*, by Fred Mather in 1874.
12. Grayling, *Thymallus tricolor*, by Fred Mather in 1875.
13. Sturgeon, *Acipenser sturio*, by Seth Green in 1875.
14. Smelt, *Osmerus mordax*, by James Ricardo in 1876.
15. Herring, *Clupea harengus*, by Vinal N. Edwards in 1877.
16. Alewife, *Clupea vernalis*, by T. B. Ferguson in 1877.
17. Oyster, *Ostrea virginica*, by W. K. Brooks in 1877.
18. Cod, *Gadus morrhua*, by James W. Milner in 1878.
19. Haddock, *Melanogrammus æglefinus*, by R. Edward Earll in 1879.
20. Carp, *Cyprinus carpio*, by Rudolph Hessel in 1879.
21. Spanish mackerel, *Scomberomorus maculatus*, by R. Edward Earll in 1880.
22. Cero, *Scomberomorus regalis*, by R. Edward Earll in 1880.
23. Moon-fish, *Chætodipterus faber*, by R. Edward Earll in 1880.
24. Silver gar, *Tylosurus marinus*, by Marshall McDonald in 1881.
25. Gold-fish, *Carassius auratus*, by Rudolph Hessel in 1881.
26. Tench, *Tinca vulgaris*, by Rudolph Hessel in 1881.
27. Soft-shelled clam, *Mya arenaria*, by J. A. Ryder in 1881.

As the operations of the Commission have increased, and the propagation of additional species has been undertaken, it has been found desirable to increase the number of hatching stations. These are of two kinds, known as collecting and distributing stations. The former are located near the spawning grounds of those species for which they are especially intended. The eggs are secured at these stations, and enough having been reserved to stock the waters of that region, the remainder

are sent to distributing stations, usually located at some central point, to be hatched and shipped to the waters for which they are intended.

The following is a list of the hatching stations operated by the U. S. Fish Commission in 1883:

1. Grand Lake Stream, Maine, station for collecting eggs of the Schoodic salmon (*Salmo salar*, subsp. *sebago*).
2. Bucksport, Me., station for collecting and hatching eggs of the Atlantic salmon (*Salmo salar*), and for hatchings eggs of white-fish (*Coregonus clupeiformis*) to be distributed in the waters of the State.
3. Wood's Holl, Mass. Permanent coast station, which serves as a base of operations for the scientific investigations of the Commission, and as a hatching station for eggs of the cod (*Gadus morrhua*) and other sea-fishes.
4. Cold Spring Harbor, Long Island, New York. Station for hatching eggs of various species of *Salmonidæ* for distribution in New York and vicinity.
5. Havre de Grace, Md. Station located on Battery Island, in the Susquehanna River, for the purpose of collecting and hatching eggs of the shad (*Clupea sapidissima*).
6. Washington, D. C.
   a. National Carp ponds. Ponds for the propagation of the three varieties of the carp (*Cyprinus carpio*), and the gold-fish (*Carassius auratus*), the golden ide (*Idus melanotus*, var. *auratus*), and the tench (*Tinca vulgaris*).
   b. Arsenal ponds. Ponds for the propagation of carp (*Cyprinus carpio*).
   c. Navy-yard. Station for collecting and hatching eggs of the shad (*Clupea sapidissima*).
   d. Central hatching station. A station fully equipped for scientific experiments connected with propagation of fishes. The station is also provided with apparatus for hatching the eggs of all of the more important species, including light, heavy, and adhesive eggs. It is the principal distributing station of the Fish Commission, for both eggs and young fish, to all portions of the United States.
7. Wytheville, Va. A station for hatching eggs of brook-trout (*Salvelinus fontinalis*) and California trout (*Salmo irideus*).
8. Saint Jerome's Creek, Point Lookout, Maryland. A station for the artificial propagation of the oyster (*Ostrea virginica*), the Spanish mackerel (*Scomberomorus maculatus*), and the banded porgy (*Chætodipterus faber*).
9. Avoca, N. C. A station on Albemarle Sound, at the junction of Roanoke and Chowan Rivers, for collecting, hatching, and distributing eggs of the shad (*Clupea sapidissima*), alewife (*Clupea vernalis* and *C. æstivalis*), and striped bass (*Roccus striatus*).

10. Northville, Mich. A hatching station for the devolopment and distribution of eggs of the whitefish (*Coregonus clupeiformis*). This station is also provided with tanks and ponds for the spawning, hatching, and rearing of brook-trout (*Salvelinus fontinalis*) and California trout (*Salmo irideus*).
11. Alpena, Mich. A station for the collection and development of the eggs of the white-fish (*Coregonus clupeiformis*).
12. Baird, Cal.
    a. Salmon station. A station on the McCloud River for the development and distribution of eggs of the California salmon (*Oncorhynchus chouicha*).
    b. Trout ponds. A station near Baird, for collecting, developing, and distributing eggs of the California trout (*Salmo irideus*).
13. Clackamas River, Oregon. A station on Columbia River for collecting and hatching eggs of the California salmon (*Oncorhynchus chouicha*).

To enable the public to form some idea of the extent of public fish-culture within the limits of the United States, a brief description of the operations of several of the larger stations operated by the U. S. Fish Commission is given.

The hatchery at Northville, Mich., under the direction of Mr. Frank N. Clark, passed into the hands of the U. S. Fish Commission in 1880, and is now one of the most important stations for salmonidæ in the world. It is provided with natural and artificial ponds in which brook-trout, rainbow-trout, land-locked salmon and lake-trout, are kept for breeding purposes. In addition to the eggs obtained from these ponds, many millions of eggs of the whitefish, lake-trout, and wall-eyed pike are obtained in the waters of Lake Erie, and forwarded to Northville to be hatched and distributed. During the season of 1882-'83, 70,950,000 eggs of the salmonidæ were handled at this hatchery, a large percentage of which were hatched and distributed to different waters. A large refrigerator is being put in readiness for next season's work, when it is expected that fully 500,000,000 eggs of the whitefish alone will be hatched.

The hatcheries at Bucksport and Grand Lake Stream are both under the superintendence of Mr. Charles G. Atkins. The former of these is provided with ponds in which salmon, purchased from the fishermen of the Penobscot River, in May, are confined till November, at which time the eggs are taken and the fish liberated. At Grand Lake Stream, where the land-locked salmon are hatched, the eggs are obtained from the wild fish which, when attempting to ascend to their natural spawning grounds, are turned aside into inclosures of netting, where they are retained until all of the eggs have been secured. There were secured at these two stations, during the past season, 3,675,000 eggs of these species for distribution to different parts of the United States.

The hatchery on the McCloud River in California was established in 1872, under the superintendence of Mr. Livingston Stone, who has secured large quantities of eggs of the California salmon annually. The eggs have been taken from the wild salmon, which have been prevented from ascending to their natural spawning grounds by a dam which he has caused to be thrown across the river just above the hatchery. Eggs of the rainbow-trout also have been secured in considerable numbers.

Owing to the lateness of the appropriation, little was done at the hatchery last year, only 4,000,000 salmon and 337,500 trout eggs being secured. Most of these were hatched and planted in the waters of the Sacramento River. Mr. Stone gives the following comprehensive statement of the work accomplished since the establishment of the hatchery.

In the eleven years since the salmon-breeding station has been in operation, 67,000,000 eggs have been taken, most of which have been distributed in the various States of the Union. Several millions, however, have been sent to foreign countries, including Germany, France, Great Britain, Denmark, Russia, Belgium, Holland, Canada, New Zealand, Australia, and the Sandwich Islands. About 15,000,000 have been hatched at the station, and the young fish placed in the McCloud and other tributaries of the Sacramento River. So great have been the benefits of this restocking of the Sacramento that the statistics of the salmon fisheries on the Sacramento show that the annual salmon catch of the river has increased 5,000,000 pounds during the last few years.

The shad stations at Washington, D. C., and Havre de Grace, Md., have been recently enlarged, and are now capable of holding immense numbers of eggs. At one of the Washington stations alone nearly 50,000,000 of eggs were received. An estimate of those for the other stations gives a total of over 70,000,000 eggs of this species.

The work of the Commission has been by no means confined to the replenishing of depleted waters, but an effort has been made to introduce desirable species into localities where they had not previously existed; American fishes have been sent abroad, and foreign fishes have been introduced into American waters. The experiments in acclimatization, as would naturally be expected, have not always been successful, but in some cases they have been remarkably so. The shad has been introduced into the tributaries of the Gulf of Mexico and of the Pacific coast, and large shad are now not uncommon in the California markets. Glowing accounts are given of the introduction of the California salmon into Australian waters, and the Atlantic salmon and California trout are reported to be thriving well in the waters of Continental Europe, especially in those of Germany and the Netherlands. The last-named species has been introduced into small streams and ponds east of the Mississippi, and seems destined to become one of the important fishes of this region. Attempts have also been made to introduce the Lake whitefish into numerous inland waters, but sufficient time has not

yet elapsed to warrant a statement regarding the success or failure of the experiment.

The most satisfactory results thus far in acclimatization have been obtained from the introduction of German carp. A desirable food-fish was needed for the inland waters of our Western and Southern States, and the German carp was found to meet this want. The first carp were imported into this country by the United States Fish Commission in 1877, ponds being prepared for them at Baltimore and Washington. In 1880, the distribution of fry began, and by January 1, 1883, they had been planted in not less than 17,860 localities, covering nearly every State and Territory. They proved to be especially adapted to our waters, and in some localities grew with surprising rapidity reaching more than twice the weight attained in the same time in German waters. An instance is cited where a carp 4 inches long placed in the waters of Texas was found to have increased to 20½ inches in length in eleven months, at which time it weighed 4 pounds 11 ounces. Arrangements are being made by the Fish Commission to continue the distribution of carp upon a larger scale than heretofore.

Owing to the existence of so many private fish-cultural establishments, and the fact that the statistics of the work of some of the State commissions are inaccessible, it is hardly practicable to attempt to furnish statistics of the extent of fish-culture within the United States. The following table, however, shows the statistics for the six principal species hatched by the United States Fish Commission, from its origin to the present time:

Table of the principal hatching operations of the United States Fish Commission from 1872 *to* 1883.*

Year.	Number of young fish hatched and planted in open waters.						
	Shad.	California salmon.	Schoodic salmon.	Penobscot salmon.	Whitefish.	California trout.	Total.
1872	859,000	6,000	.....	10,000	25,000	.....	900,000
1873	3,003,000	1,511,230	4,000	437,797	25,000	.....	4,981,027
1874	3,561,000	2,531,500	7,250	1,174,918	.....	.....	7,274,668
1875	12,055,550	4,538,039	731,600	955,900	120,000	.....	18,401,089
1876	6,330,400	4,663,031	341,950	765,000	2,370,000	.....	14,470,381
1877	11,183,300	5,127,875	1,295,925	97,500	300,000	.....	18,004,600
1878	16,165,500	7,821,057	1,304,278	.....	.....	.....	25,290,835
1879	15,589,500	4,558,576	525,300	20,574	655,000	.....	21,348,950
1880	28,626,000	3,165,652	2,068,500	81,729	200,000	44,002	34,185,883
1881	†70,035,000	3,650,000	†860,000	†2,611,000	†19,500,000	†261,000	96,917,000
1882	‡50,000,000	†4,000,000	†1,496,000	†2,100,000	†50,000,000	†337,500	107,933,500
Total.	217,408,250	41,572,960	8,634,803	8,254,418	73,195,000	642,502	349,707,933

*Other species have been hatched for distribution, but only in limited numbers, no organized and continuous efforts having been made for the propagation of any except those named.

†Including both those produced at the local hatchery and eggs sent to other hatching establishments to be hatched there.

‡Estimated.

B.—INVESTIGATION.

I.—Commissions and societies engaged in the investigation of questions pertaining to fish-culture.

1. Portraits and photographs of prominent fish-culturists.

UNITED STATES FISH COMMISSIONER.

Crayon portrait.

A crayon portrait of Spencer F. Baird, United States Commissioner of Fish and Fisheries. Size, 22 by 28 inches. Washington, 1883. L. Moeller, artist.

STATE FISH COMMISSIONERS.

Photographs (mostly cabinet size).

J. J. Gosper, Prescott, Ariz.
Richard Rule, Tombstone, Ariz.
J. H. Taggart, Yuma, Ariz.
J. H. Hornibrook, Little Rock, Ark.
John E. Reardon, Little Rock, Ark.
H. H. Rottaken, Little Rock, Ark.
S. R. Throckmorton, San Francisco, Cal.
W. E. Sisty, Denver, Colo.
Dr. Wm. M. Hudson, Hartford, Conn.
Robert G. Pike, Middletown, Conn.
G. N. Woodruff, Sherman, Conn.
Enoch Moore, Wilmington, Del.
J. T. Henderson, Atlanta, Ga.
S. P. Bartlett, Quincy, Ill.
N. K. Fairbank, Chicago, Ill.
S. P. McDoel, Aurora, Ill.
Calvin Fletcher, Spencer, Ind.
A. A. Mosher, Spirit Lake, Iowa.
D. B. Long, Ellsworth, Kans.
P. H. Darby, Louisville, Ky.
Wm. Griffith, Louisville, Ky.
W. C. Price, Danville, Ky.
H. O. Stanley, Dixfield, Me.
G. W. Delawder, Oakland, Md.
Thomas Hughlett, Easton, Md.
F. W. Putnam, Cambridge, Mass.
A. J. Kellogg, Detroit, Mich.

PHOTOGRAPHS—Continued.

Daniel Cameron, La Crescent, Minn.
R. Ormsby Sweeney, Saint Paul, Minn.
J. S. Logan, Saint Joseph, Mo.
B. E. B. Kennedy, Omaha, Nebr.
R. R. Livingston, Plattsmouth, Nebr.
W. L. May, Fremont, Nebr.
Dr. Edward Spalding, Nashua, N. H.
Benjamin P. Howell, Woodbury, N. J.
Eugene G. Blackford, New York City, N. Y.
Richard U. Sherman, New Hartford, N. Y.
Edward Meigs Smith, Rochester, N. Y.
L. A. Harris, Cincinnati, Ohio.
H. C. Post, Sandusky, Ohio.
Robert Dalzell, Pittsburg, Pa.
Ben. L. Hewit, Hollidaysburg, Pa.
John Hummel, Selinsgrove, Pa.
A. P. Butler, Columbia, S. C.
C. J. Huske, Columbia, S. C.
H. H. Sneed, Chattanooga, Tenn.
Herbert Brainard, Saint Albans, Vt.
Hiram A. Cutting, Lunenburg, Vt.
Col. M. McDonald, Washington, D. C.
N. M. Lowery, Hinton, W. Va.
Henry B. Miller, Wheeling, W. Va.
John F. Antisdell, Milwaukee, Wis.
Mark Douglas, Melrose, Wis.

MEMBERS OF AMERICAN FISH-CULTURAL ASSOCIATION.

PHOTOGRAPHS (mostly cabinet size).

James Annin, jr., Caledonia, N. Y.
Perry Belmont, New York City, N. Y.
W. H. Butler, New York City, N. Y.
Oscar Comstock, New York City, N. Y.
W. A. Conklin, Central Park, N. Y.
H. P. Dwight, Toronto, Ont.
Charles B. Evarts, Windsor, Vt.
Seth Green, Rochester, N. Y.
Frederick Habershaw, New York City, N. Y.
Charles Hallock, New York City, N. Y.
W. B. Hopson, Baltimore, Md.
Benjamin P. Howell, jr., Woodbury, N. J.
Charles M. Hutchinson, Utica, N. Y.
S. M. Johnson, Boston, Mass.
C. A. Kingsbury, M. D., Philadelphia, Pa.

PHOTOGRAPHS—Continued.

George N. Lawrence, New York City, N. Y.
Theodore Lyman, Brookline, Mass.
H. D. McGovern, Brooklyn, N. Y.
Fred Mather, New York City, N. Y.
S. B. Miller, New York City, N. Y.
Theodore Marford, New York City, N. Y.
Charles Pease, Cleveland, Ohio.
Thomas E. Porter, Coventry, Conn.
Herman P. Schuyler, Troy, N. Y.
G. H. Shaffer, Brooklyn, N. Y.
Charles W. Smiley. Washington, D. C.
Elisha Sterling, Cleveland, Ohio.
Livingston Stone, Charlestown, N. H.
H. H. Thompson, Brooklyn, N. Y.
John H. Thompson, Bristol, Mass.
J. S. W. Thompson, New Hope, Pa.
C. Van Brunt, New York City, N. Y.

PRIVATE FISH-CULTURISTS.

(Not mentioned in this section.)

II.—RESULTS OF INQUIRY.

2. PUBLICATIONS.

PUBLICATIONS OF U. S. FISH COMMISSION.

CIRCULARS, REPORTS, &C.

1. Circular regarding tagged fish in Lake Michigan, 1871.
2. Memoranda of inquiry. 1872.
3. Questions; food-fishes. 1872.
4. Circular to accompany No. 3. 1872.
5. Statistics; menhaden fisheries; circular, 1873.
6. Report. Part I. 1873.
7. Report. Part I, with supplement. United States Commission of Fish and Fisheries. Part 1.— | Report | on the | condition of the sea fisheries | of the south coast of New England | in | 1871 and 1872, | by | Spencer F. Baird, Commissioner. | — | With supplementary papers. | — | Washington: | Government Printing Office. | 1873. [8vo. pp. xlvii, 852, plates xxxviii, with 38 leaves explanatory to plates, 2 maps.]

   The report of the Commissioner, without supplementary papers, pp. xlvii, was issued separately in advance. Title page the same.

CIRCULARS, REPORTS, &c.—Continued.

8. Report. Part II. 1874.
9. Report. Part II, with supplement.

United States Commission of Fish and Fisheries. | Part II. | Report | of | the Commissioner | for | 1872 and 1873. | — | A.—Inquiry into the decrease of the food-fishes. | B.—The propagation of food-fishes in the waters | of the United States. | — | With supplementary papers. | Washington: | Government Printing Office. | 1874. [8vo. pp. CII, 808, pls. xxxvii, 4 maps.]

10. Statistics of fishery marine. Circular. 1875.
11. Blank tables to accompany No. 10. 1875.
12. Circular asking statistics. Menhaden fisheries. 1875.
13. Report. Part 3. 1876.
14. Report. Part 3. With supplement. 1876.

United States Commission of Fish and Fisheries. | Part III. | Report | of | the Commissioner | for | 1873–'74 and 1874–'75. | — | A.—Inquiry into the decrease of the food-fishes. | B.—The propagation of food-fishes in the waters | of the United States. | — | Washington: | Government Printing Office. | 1876. [8vo., pp. LII, 777.]

15. Questions; food-fishes. 2d ed. 1877.
16. Circular. Statistics; mackerel, &c. To accompany 15. 1877.
17. Circular. Statistics; cod fishing, &c. To accompany 15. 1877.
18. Circular. Statistics; mullet fishing, &c. To accompany 15. 1877.
19. Circular. Statistics of coast and river fisheries. 1877.
20. New York market blanks. 1877.
21. Statistics of the whale-fishery; census blanks.
22. (*a*) Propagation series.
23. (*b*) Propagation series.
24. (*c*) Propagation series.
25. Record of collection of eggs.
26. Report. Part IV. 1878.
27. Report. Part IV, with supplement.

United States Commission of Fish and Fisheries. | — | Part IV. | — | Report | of | the Commissioner | for | 1875–1876. | — | A.—Inquiry into the decrease of the food-fishes. | B.—The propagation of food-fishes in the waters of the United States. | — | Washington: | Government Printing Office. | 1878. [8vo., pp. ix, 50*, 1029, plates vi (Hist. of Whale Fishery.)]

28. Circular. Questions; cod fishing. 1878.
29. Circular. Questions; alewife fisheries. 1878.
30. Circular. Questions; smelt fisheries. 1878.
31. Blank. Statistics New England fish markets. 1878.

CIRCULARS, REPORTS, &c.—Continued.

32. Questions; mackerel fisheries. 1879, January.
33. Acknowledgment of response. 1879, May.
34. Circular to accompany mackerel circular. 1879, January.
35. Ocean temperature blanks. 1878.
36. Application for fish. 1879, April.
37. Report. Part V. 1879, October.
38. Report. Part V, with supplement. 1879, October.

United States Commission of Fish and Fisheries. | — | Part V. | — | Report | of | the Commissioner | for | 1877. | — | A.—Inquiry into the decrease of food-fishes. | B.—The propagation of food-fishes in the | waters of the United States. | — | Washington: | Government Printing Office. | 1879. | [8 vo., pp. 48, 972.]

39. Record of dredging stations (blank). 1879, September.
40. Circular inviting co-operation. F. C. & Census. 1879, July.
41. Returns for 40. 1879, July.
42. Circular relating to fish trade. 1879, July.
43. Returns for 42. 1879, July.
44. Prospectus of investigation. 1879, August.
45. Note-book for statistics of fishery marine. 1879, September.
46. Fishery marine blanks. 2d ed. 1879, September.
47. Letter to persons interested in fish culture. 1879, October.
48. Questions to accompany 47. 1879, October.
49. Circular to practical fish culturists. 1879, October.
50. Fixtures for salmon hatching. F. C. Report, Part 6. 1879, October.
51. Coast town index. 1879, October.
52. Hektograph letter to Rhode Island postmasters. 1879, November.
53. The river fisheries. 1879, October.
54. Letter of the Postmaster-General to postmasters. 1879, October.
55. 43 revised. Postmasters upon fish consumption. 1879, October.
56. Property record. 1879, October.
57. Measurements of fishes, old.
58. Property receipts, old No. 3179.
59. Questions relating to the menhaden (hektograph) (two forms). 1879, November.
60. Scale for fish measure. 1879, December.
61. Record of observations at hatching stations, old.
62. Record of operations at hatching stations, old.
63. ———.
64. Record of distribution, old.
65. Book record of collection of eggs, old.
66. Ingersoll's oyster circular (two forms). 1880, January.

CIRCULARS, REPORTS, &C.—Continued.

67. Record of river fisheries to accompany 68 (hektograph). 1880, February.
68. Book record of river fisheries. 1880, February.
69. Record of ocean temperatures for use on mackerel and menhaden vessels. 1880, February.
70. Edmonds' circular to Maryland oyster dealers and Baltimore fish dealers (two forms). 1880, February.
71. Hektograph letter to postmasters about imperfect returns. 1879, December.
72. Supplement to 41 (hektograph). 1879, December.
73. Fish-guano letter to postmasters (hektograph). 1879, December.
74. Inquiry for coast town addresses (hektograph). 1880, January.
75. Inquiry for coast towns (hektograph). 1880, February.
76. Blank form; expenses tenth census of the United States; statistics of the fisheries.
77. Menhaden fishery marine (two forms). 1880, February.
78. Berlin shipping list. 1880, February 20.
79. Letter in regard to Berlin exhibits. 1880, February 25.
80. Letter in regard to New York markets (Phillips). 1880, February.
81. Railroad circular. 1880, February.
82. Manufacturers' circular. 1880, February.
83. Report. Part VI. 1880.
84. Report. Part VI, with supplement. 1880.

United States Commission of Fish and Fisheries. | — | Part VI. | — | Report | of | the Commissioner | for | 1878. | — | A.—Inquiry into the decrease of food-fishes. | B.—The propagation of food-fishes in the | waters of the United States. | — | Washington: | Government Printing Office. | 1880. | [8 vo, pp. LXIV, 988, pl. XVI.]

85. Report. Part VII. 1879.
86. Report. Part VII, with supplement, 1879.

United States Commission of Fish and Fisheries. | — | Part VII. | — | Report | of | the Commissioner | for | 1879. | — | A.—Inquiry into the decrease of food-fishes. | B.—The propagation of food-fishes in the waters of the United States. | — | Washington: | Government Printing Office. | 1882. | [8 vo, pp. LII, 846, pl. XLVI.]

87. Bulletin. Vol. I. 1882.

Bulletin | of | the United States Fish Commission. | Vol. I, | for 1881. | — | Washington: | Government Printing Office. | 1882. | [8 vo, pp. 466, pl. XXI.]

CIRCULARS, REPORTS, &c.—Continued.

88. Bulletin. Vol. II. 1883.

Bulletin | of the | United States Fish Commission. | Vol. II, | for 1882. | — | Washington: | Government Printing Office. | 1883. | [8 vo, pp. 468, fig. 28.]

PUBLICATIONS OF STATE FISH COMMISSIONS.*

ALABAMA.

(1) Preliminary report and memorial, Dec. 13, 1870: 4 pp. 1870.
(2) R. of Cs. to the governor, January 26, 1872, Jan. 26, 1872: 7 pp. 1872.

CALIFORNIA.

(1) [First Biennial] R. of Cs. for 1870 and 1871, Dec. 31, 1871?: 24 pp. 1872.
(2) [Second Biennial] R. of Cs. for 1872 and 1873, Dec. 31, 1873?: 18 pp. 1873.
(3) [2d Biennial] R. of Cs. for 1872 and 1873 [Repr.], Dec. 31, 1873?: 28 pp. 1874.
(4) [Third Biennial] R. of Cs. for 1874 and 1875, Dec. 31, 1875?: 36 pp. 1875.
(5) [Fourth Biennial] R. of Cs. for 1876 and 1877, Nov. 10, 1877: 30 pp. 1877.
(6) [Fifth Biennial] R. of Cs. for 1878 and 1879, Nov. 1, 1879: 63 pp. 1879.
(7) [Sixth] R. of Cs. for 1880, Jan., 1881?: 70 pp. 1881.
(8) [Seventh] R. of Cs. for 1881 and 1882, Jan., 1883: 31 pp. 1883.

COLORADO.

(1) [First and second reports.] [Unpublished?] Dec. 1, 1878? Unpublished?
(2) [3d and 4th reps.] Biennial R. of C. for 1879–'80, Dec. 1, 1880: 34 pp. 1881.
(3) [Fifth report] Biennial R. of C. for 1881 and 1882, Dec. 1, 1882: 11 pp. 1882.

CONNECTICUT.

(1) [First] R. of Cs. to Gen. Assem., May sess., 1867, May, 1867: 27 pp. 1867.

---

* List prepared by Charles W. Smiley, at the request of Professor Baird, for the London Fisheries Exhibition.

The date of publication is placed at the extreme right, and is preceded by the number of pages contained in the issue. This is preceded by the date when the report was officially made if known; otherwise the date at which the report seems to close is inserted with a query (?). The number on the left refers to the bibliography of reports; the number in brackets to the State series. Words in brackets do not occur on the title-pages of the reports. R. of C. is used as an abbreviation for Report of Commissioner; Cn. for Commission; Cs. for Commissioners.

CONNECTICUT—Continued.

(2) [Second] R. of Cs. to Gen. Assem., May sess., 1868, May, 1868: 28 pp. 1868.

(3) [Third] R. of Cs. to Gen. Assem., May sess., 1869, May, 1869: 18 pp. 1869.

(4) Fourth R. of Cs. to Gen. Assem., May sess., 1870, May 7, 1870: 37 pp. 1870.

(5) Fifth R. of Cs. to Gen. Assem., May sess., 1871, May 12, 1871: 46 pp. 1871.

(6) Sixth R. of Cs. to Gen. Assem., May sess., 1872, Apr. 26, 1872: 36 pp. 1872.

(7) Seventh R. of Cs. to Gen. Assem., May sess., 1873, May 1, 1873: 48 pp. 1873.

(8) Eighth R. of Cs. to Gen. Assem., May sess., 1874, Apr. 30, 1874: 36 pp. 1874.

(9) Ninth R. of Cs. to Gen. Assem., May sess., 1875, May 1, 1875: 32 pp. 1875.

(10) Tenth R. of Cs. to Gen. Assem., May, 1876, May 17, 1876: 34 pp. 1876.

(11) Eleventh R. of Cs. to Gen. Assem., Jan., 1877, Jan. 1, 1877: 33 pp. 1877.

(12) Twelfth R. of Cs. to Gen. Assem., Jan., 1878, Jan. 1, 1878: 24 pp. 1878.

(13) Thirteenth R. of Cs. to Gen. Assem., Jan., 1879, Jan. 1, 1879: 34 pp. 1879.

(14) Fourteenth R. of Cs. to Gen. Assem., Jan., 1880, Jan. 1, 1880: 23 pp. 1880.

(15) Fifteenth R. of Cs. to Gen. Assem., Jan., 1881, Jan. 1, 1881: 32 pp. 1881.

(16) Sixteenth R. of Cs. to Gen. Assem., Jan., 1882, Dec. 1, 1881: 33 pp. 1881.

(17.) 1st R. of Shell-fish Cs. to Gen. Assem., Jan., 1882, Dec. 1, 1881: 99 pp. 1882. In same cover with (16).

(18) 2d R. of Shell-fish Cs. to Gen. Assem., Jan., 1883, Nov. 30, 1882: 44 pp. 1883.

(19) Seventeenth R. of Cs. to Gen. Assem., Jan., 1883, Dec. 1, 1882: 28 pp. 1883.

DELAWARE.

(1) First Biennial R. of C. for years 1881–'82, Jan., 1883?: 14 pp. 1883.

GEORGIA.

(1) R. of C. of Agriculture for the year 1876, Dec. 31, 1876?: pp. 6, 7, 1877.

(2) R. of C. of Agriculture for the year 1877, Dec. 31, 1877?: pp. 29, 30. 1878.

GEORGIA—Continued.

(3) [First Biennial] R. of Supt. of Fisheries, Oct. 15, 1880: pp. 33–38. 1880. [In R. of C. of Agr., for 1879–'80.]
(4) [Second Biennial] R. of Supt. of Fisheries, Oct. 15, 1882: pp. 37–44. 1882. [In R. of C. of Agr., years 1881–'82.]

ILLINOIS.

(1) [First] R. of C. from July 1, 1879 to Sept. 30, 1880, Oct. 1, 1880: 14 pp. 1880.
(2) [Second] R. of Cn. from July 1, 1879 to Sept. 30, '82, Oct. 1, 1882: 33 pp. 1883.

INDIANA.

(1) First Annual R. of C. to General Assembly, Jan., 1883: 103 pp. 1883.

IOWA.

(1) First R. of Cs. for years 1874 and 1875, Oct. 27, 1875?: 40 pp. 1876.
(2) 2d Biennial R. of Cn. for 1875–'76, 1876–'77, Oct. 13, 1877: 31 pp. 1877.
(3) Third Biennial R. of Cn. for 1877–'78, 1878–'79, Oct. 1, 1879: 54 pp. 1880.
(4) Fourth Biennial R. of Cn. for 1879–'80, 1880–'81, Oct. 31, 1881: 38 pp. 1882.

KANSAS.

(1) First Biennial R. of C. for years 1877–'78, June 30, 1878: 20 pp. 1878.
(2) Supplemental R. for December, 1878. Jan. 25, 1879: 3 pp. 1879.
(3) Second Biennial R. of C. [for years 1879–'80], June 30, 1880: 19 pp. 1880.
(4) Third Biennial R. of C. for years 1881–'82, June 30, 1882: 69 pp. 1883.

KENTUCKY.

(1) First R. of Cs. for year ending Nov. 1, 1877, Nov. 1, 1877: 22 pp. 1878.
(2) Second Biennial R. of Cn. for 1877–'78, 1878–'79, Nov. 1, 1879: 30 pp. 1879.
(3) Third Biennial R. of Cn. for 1879–'80, 1880–'81, Oct. 10, 1881: 26 pp. 1882.

MAINE.

(1) First R. of Cs. for the year 1867, Jan. 16, 1868: 96 pp. 1869.
(2) Second R. of Cs. for the year 1868, Dec. 31, 1868: 45 pp. 1869.
In same cover with (1).

MAINE—Continued.

(3) Third R. of C. for the year 1869, Dec. 31, 1869: 48 pp. 1870.
(4) Fourth R. of C. for the year 1870, Dec. 31, 1870: 56 pp. 1870.
(5) Fifth R. of C. for the year 1871, Dec. 31, 1871: 31 pp. 1872.
(6) Sixth R. of Cs. for the year 1872, Dec. 31, 1872?: 16 pp. 1873.
(7) Seventh R. of Cs. for the year 1873, Dec. 31, 1873?: 39 pp. 1873.
(8) Eighth R. of Cs. for the year 1874, Nov. 30, 1874: 32 pp. 1874.
(9) Ninth R. of Cs. for the year 1875, Dec. 9, 1875?: 40 pp. 1875.
(10) Tenth R. of Cs. for the year 1876, Dec. 9, 1876?: 31 pp. 1876.
(11) Eleventh R. of Cs. for the year 1877, Nov. 31, 1877?: 30 pp. 1877.
(12) Twelfth R. of Cs. for the year 1878, Dec. 31, 1878?: 26 pp. 1878.
(13) [Thirteenth] R. of C. for the year 1879, Dec. 31, 1879?: 35 pp. 1879.
(14) [Fourteenth] R. of C. for the year 1880, Dec. 31, 1880?: 55 pp. 1880.
(15) [Fifteenth] R. of C. for the year 1881, Dec. 31, 1881: 31 pp. 1882.
(16) [Sixteenth] R. of C. for the year 1882, Dec. 1, 1882: 38 pp. 1882.

MARYLAND.

(1) R. upon oyster resources in Maryland, Oct., 1869: 20 pp. 1870.
(2) R. on oyster fisheries, shad and herring fisheries, &c., Jan., 1872: 48 pp. 1872.
(3) R. of Commander of oyster fisheries, &c., Jan. 1, 1872: 11 pp. 1874.
(4) R. of Cs. to General Assembly, Jan. 1, 1876, Jan. 1, 1876: 239 pp. 1876.
(5) R. of a C., January 1877, Jan. 1, 1877?: 108 pp. 1877.
(6) R. of a C., January, 1878, Jan. 1, 1878?: 156 pp. 1878.
(7) R. of Cs., January, 1879, Jan. 1, 1879?: 56 pp. 1879.
(8) R. of Cs., January, 1880, Jan. 1, 1880?: 355 pp. 1880.
(9) R. of T. B. Ferguson, a C., January, 1881, Jan, 1, 1881?: 294 pp. 1881.
(10) R. of Thomas Hughlett, a C., January, 1881, Jan. 1, 1881?: Unpublished.
(11) R. of Thomas Hughlett, a C., January, 1882, Jan. 1, 1882?: 32 pp. 1882.
(12) R. of Cs., January, 1883, Dec. 19, 1882: 31 pp. 1883.

MASSACHUSETTS.

(1) R. of Cs., appointed 1856; Chap. 58, May 5, 1857: 54 pp. 1857.
(2) [First] R. of Cs., under resolve of May 3, 1865, Dec. 1, 1865: 77 pp. 1866?

MASSACHUSETTS—Continued.

(3) [Second] R. of Cs. for year ending Jan. 1, 1868, Jan., 1868: 50 pp. 1868.

(4) [Third] R. of Cs. for year ending Jan. 1, 1869, Jan., 1869: 71 pp. 1869.

(5) [Fourth] R. of Cs. for year ending Jan. 1, 1870, Jan., 1870: 67 pp. 1870.

(6) Fifth R. of Cs. [for year ending], January, 1871, Jan., 1871: 77 pp. 1871.

(7) Sixth R. of Cs. for year ending Jan. 1, 1872, Jan., 1872: 270 pp. 1872.

(8) Seventh R. of Cs. for year ending Jan. 1, 1873, Jan., 1873: 35 pp. 1872.

(9) Eighth R. of Cs. for year ending Jan. 1, 1874, Dec. 1, 1873: 63 pp. 1874.

(10) Ninth R. of Cs. for year ending Jan. 1, 1875, Dec. 1, 1874: 57 pp. 1875.

(11) Tenth R. of Cs. for year ending Jan. 1, 1876, Dec. 15, 1875?: 72 pp. 1876.

(12) Eleventh R. of Cs. for year ending Jan. 1, 1877, Dec. 31, 1876?: 50 pp. 1877.

(13) Twelfth R. of Cs. for year ending Jan. 1, 1878, Dec. 1, 1877?: 68 pp. 1878.

(14) Thirteenth R. of Cs. for year ending Sept. 30, 1878, Oct., 1878?: 63 pp. 1879.

(15) Fourteenth R. of Cs. for year ending Sept. 30, 1879, Oct., 1879?: 50 pp. 1880.

(16) Fifteenth R. of Cs. for year ending Sept. 30, 1880, Oct., 1880?: 77 pp. 1881.

(17) Sixteenth R. of Cs. for year ending Sept. 30, 1881, Oct., 1881?: 62 pp. 1882.

(18) Seventeenth R. of Cs. year ending Dec. 31, 1882, Dec., 1882?: 58 pp. 1883.

MICHIGAN.

(1) First [Biennial] R. of Cs. and Supt. for 1873–'74, ending Dec. 1, 1874, Dec. 1, 1874: 67 pp. 1875.

(2) Second [Biennial] R of Cs. and Supt. for 1875–'76, ending Dec. 20, 1876, Dec. 20, 1876?: 67 pp. 1876.

(3) Third [Biennial] R. of Supt. for 1877–'78, ending Dec. 20, 1878, Dec. 20, 1878?: 96 pp. 1879.

(4) Fourth [Biennial] R. of Cs. and Supt. for 1879–'80, ending Dec. 1, 1880, Dec. 1, 1880: 52 pp. 1881.

(5) Fifth Biennial R. of Supt. for 1881–'82, ending Dec. 1, 1882, Dec. 1, 1882: 26 pp. 1883.

MINNESOTA.

(1) First R. of Cs. [for year ending Dec. 31, 1874], Feb. 20, 1875: 30 pp. 1875.
(2) Second R. of Cs. [for year ending Dec. 31, 1875], Dec., 1875?: 19 pp. 1876.
(3) Third R. of Cs. for year ending Dec. 31, 1876, Dec., 1876?: 14 pp. 1877.
(4) Fourth R. of Cs. for year ending Dec. 31, 1877, Dec., 1877?: 34 pp. 1878.
(5) Fifth R. of Cs. for year ending Dec. 31, 1878, Dec. 1878?: 22 pp. 1879.
(6) Sixth and seventh R. of Cn. for 1879 and 1880, Jan., 1881?: 32 pp. 1881.
(7) Eighth [and ninth] R. of Cn. for 1881–'82, Dec. 1, 1882: 84 pp. 1883.

MISSOURI.

(1) [First] R. of Cs. [for 1880], Jan. 27, 1881: 42 pp. 1881.
(2) [Second] R. of Cn. for the years 1881 and 1882, Jan. 26, 1883: 62 pp. 1883.

NEBRASKA.

(1) [First] R. of Cs. for the year 1879, Jan. 1, 1880?: 16 pp. 1880.
(2) Second R. of Cs. [for year ending] Dec. 31, 1880, Dec. 31, 1880: 19 pp. 1881.
(3) Third R. of Cs. [for year ending] Dec. 31, 1882, Dec. 31, 1882: 13 pp. 1883.
(4) Fourth R. of Cs. [for year ending] Dec. 31, 1882, Dec. 31, 1882: 22 pp. 1883. In same cover with (3).

NEVADA.

(1) First Biennial R. of C. for years 1877 and 1878, Dec. 28, 1878: 7 pp. 1879.
(2) Second Biennial R. of C. for years 1879 and 1880, Dec. 31, 1880: 10 pp. 1881.
(3) [Third] Biennial R. of C. for years 1881 and 1882, Jan. 4, 1883: 11 pp. 1883.

NEW HAMPSHIRE.

(1) R. of select committee, June session, 1865, July 1, 1865: 8 pp. 1865.
(2) R. of Cs., June session, 1866, June 1, 1866: 16 pp. 1866.
(3) R. of Cs., June session, 1867, July 5, 1867: 17 pp. ms. c.
(4) R. of Cs., June session, 1868, June 18, 1868: 8 pp. 1868.
(5) R. of Cs., June session, 1869, June 21, 1869: 10 pp. 1869.
(6) R. of Cs., June session, 1870, June 10, 1870: 15 pp. 1870.
(7) R. of Cs., June session, 1871, May 29, 1871: 11 pp. 1871.

NEW HAMPSHIRE—Continued.

(8) R. of Cs., June session, 1872, May 27, 1872: 15 pp. 1872.
(9) R. of Cs., June session, 1873, May 30, 1873: 13 pp. 1873.
(10) R. of Cs., June session, 1874, May 20, 1874: 15 pp. 1874.
(11) R. of Cs., June session, 1875, Feb. 20, 1875: 16 pp. 1875.
(12) R. of Cs., June session, 1876, Mar. 2, 1876: 16 pp. 1876.
(13) R. of Cs., June session, 1877, May 19, 1877?: 45 pp. 1877.
(14) R. of Cs., June session, 1878, April 1, 1878?: 75 pp. 1878.
(15) R. of Cs., June session, 1879, May 1, 1879?: 51 pp. 1879.
(16) R. of Cs., June [session], 1880, June 1, 1880?: 61 pp. 1880.
(17) R. of Cs., June session, 1881, June 1, 1881?: 90 pp. 1881.
(18) R. of Fish and Game Cs., 1881–'82, June 1, 1882?: 47 pp. 1882.

NEW JERSEY.

(1) First R. of Cs. [for the year 1870], 1871, Dec., 1870?: 25 pp. 1871.
(2) Second R. of Cs. [for the year 1871], 1872, Dec., 1871?: 22 pp. 1872.
(3) Third R. of Cs. for the year 1872, Dec., 1872?: 28 pp. 1872.
(4) Fourth R. of Cs. for the year 1873, Dec., 1873?: 32 pp. 1873.
(5) Fifth R. of Cs. for the year 1874, Nov. 14, 1874?: 62 pp. 1874.
(6) Sixth R. of Cs. for the year 1875, Nov. 14, 1875?: 29 pp. 1875.
(7) Seventh R. of Cs. for the year 1876, Nov. 14, 1876?: 47 pp. 1876.
(8) Eighth R. of Cs. for the year 1877, Dec. 5, 1877?: 65 pp. 1877.
(9) [Ninth] R. of Cs. for the year 1878, Dec 31, 1879: 33 pp. 1878.

NEW YORK.

(1) [First] R. of Cs. to legislature, March 9, 1869, Mar. 9, 1869: 75 pp. 1869.
(2) [Second R. of Cs. to legislature, March 11, 1870, Mar. 11, 1870: 20 pp. 1870.
(3) [Third] R. of Cs. to legislature, Feb. 28, 1871, Feb. 1, 1871: 32 pp. 1871.
(4) Fourth R. of Cs. to legislature, March 19, 1872, Mar. 19, 1872?: 34 pp. 1872.
(5) [Fifth] R. of Cs. to legislature, Feb. 12, 1873, Jan., 1873: 32 pp. 1873.
(6) [Sixth] R. of Cs. to legislature, Feb, 5, 1874. Jan., 1874: 41 pp. 1874.
(7) Seventh R. of Cs. to legislature, Feb. 1, 1875, Jan., 1875: 61 pp. 1875.
(8) Eighth R. of Cs. for year ending Dec. 31, 1875, Feb., 1876: 59 pp. 1876.

NEW YORK—Continued.

(9) Ninth R. of Cs. for year ending Dec. 31, 1876, Feb., 1877: 20 pp. 1877.
(10) Tenth R. of Cs. for year 1877, Feb. 1878: 50 pp. 1878.
(11) Eleventh R. of Cs. for 2 years ending Dec. 31, 1879, April 1, 1880: 45 pp. 1880?
(12) [Twelfth] R. of Cs. for the year 1881, April 1, 1882: 83 pp. 1882.

NORTH CAROLINA.

(1) Third Qr. of C., January 15, 1878, Jan. 15, 1878: pp. 10–14. 1877.
(2) Second Qr. of C. of Agric. for the year 1878, Oct. 15, 1878: pp. 5–8. 1878.
(3) R. of Supt. [in R. of C. of Agric., 1877–'78], Jan. 6, 1879: 7–15 pp. 1879?
(4) Fish Culture in North Carolina, 1879, April 1, 1879: 26 pp. 1879.
(5) R. of Supt. [in R. of C. of Agric., 1879–'80], Dec. 31, 1880?: pp. 25–51. 1881.
(6) Second Biennial R. of Supt., 1881–'82, Dec. 31, 1882: pp. 62–81. 1883. [In R. of C. of Agric., 1883.]

OHIO.

(1) R. of Cs. for year ending December, 1873, Feb. 23, 1874: 40 pp. 1874.
(2) First R. of Cn. for years 1875 and 1876, Jan. 13, 1877: 96 pp. 1877.
(3) Second R. of Cn. for year 1877, April 9, 1878: 116 pp. 1878.
(4) Third R. of Cn. for year 1878, Jan. 14, 1879: 22 pp. 1879.
(5) Fourth R. of Cn. for year 1879, Jan. 15, 1880: 35 pp. 1880.
(6) Fifth R. of Cn. for year 1880, Jan. 20, 1881: 34 pp. 1881.
(7) Sixth R. of Cn. for year 1881, Jan. 28, 1882: 19 pp. 1882.
(8) Seventh R. of Cn. for year 1882, Jan. 29, 1883: 14 pp. 1882.

PENNSYLVANIA.

(1) R. of C. for the year 1870, Jan. 23, 1871: 48 pp. 1871.
(2) R. of C. for the year 1871, Jan. 16, 1872: 24 pp. 1872.
(3) R. of Cs. for the year 1873, Dec. 31, 1873?: 32 pp. 1874.
(4) R. of Cs. for the year 1874, Dec. 31, 1875?: 29 pp. 1875.
(5) R. of Cs. for the years 1875 and 1876, Feb. 7, 1877: 28 pp. 1877.
(6) R. of Special Committee, Dec. 1877?: 20 pp. 1878.
(7) R. of Cs. for the year 1877, Feb. 11, 1878: 38 pp. 1878.
(8) R. of Cs. for the year 1878, Feb. 20, 1879: 44 pp. 1879.
(9) R. of Cs. for the years 1879 and 1880, Feb. 15, 1881: 151 pp. 1881.

RHODE ISLAND.

(1) R. of Cs. to General Assembly, Jan., 1869, Feb. 15, 1869: 36 pp. 1869?
(2) R. of Com. [to Genl. Assem.], Jan. sess., 1870, Jan. —, 1870: 9 pp. 1870.
(3) R. of Com. of Genl. Assembly, May sess., 1870, June 15, 1870: 159 pp. 1870.
(4) [First] R. of Cs. [to G. A.], Jan. sess., 1870, Jan. 25, 1871: 4 pp. 1871?
(5) [Second] R. of Cs. [to G. A.], Jan. sess., 1872, Feb. 23, 1872; 16 pp. 1872.
(6) Third R. of Cs. to G. A., Jan. sess., 1873, Feb. 24, 1873: 12 pp. 1873.
(7) Fourth R. of Cs. to G. A., Jan. sess., 1873, Feb. 19, 1874: 10 pp. 1874.
(8) Fifth R. of Cs. to G. A., Jan. sess., 1875, Jan. 30, 1875: 20 pp. 1875.
(9) [Sixth] R. of Cs. to G. A., Jan. sess., 1876, Feb. 29, 1876: 11 pp. 1876.
(10) [Seventh] R. of Cs. to G. A., Jan. sess., 1877, Jan. 1, 1877: 11 pp. 1877.
(11) Eighth R. of Cs. to G. A., Jan. sess., 1878, Apr. 9, 1878: 19 pp. 1878.
(12) Ninth R. of Cs. to G. A., Jan. sess., 1880, Apr. 9, 1880?: 19 pp. 1880.
(13) Tenth R. of Cs. to G. A., Jan. sess., 1881, Feb. —, 1881: 32 pp. 1881.
(14) Eleventh R. of Cs. to G. A., Jan. sess., 1882, Jan. 5, 1882: 10 pp. 1882.

SOUTH CAROLINA.

(1) R. on Fish, of Agr. and Mech. Soc. Nov. 10, 1869: pp. 21–26 and 45–47. 1869.
(2) [First] R. of C. for the year 1879, Oct. 31, 1879?: pp. 569–582. 1880?
(3) [Second] R. of Supt. [R. of C. of Agr., 1880], Oct. 23, 1880: pp. 12–17. 1880.
(4) [Third] R. of Supt. [R. of C. of Agr., 1881], Oct. 31, 1881: pp. 28–42, 95. 1881.

TENNESSEE.

(1) Bienn. R. of C. to Gen. Assem., Jan. 3, 1881, Jan. 3, 1881: 13 pp. 1881.
(2) [Second] R. of Cs. for 1881–'82, Jan. (?), 1883: 24 pp. 1883.

TEXAS.

(1) First R. of C. for the year 1880, Dec. 1, 1880: 26 pp. 1880.
(2) R. of C. for the year 1882, Jan. 1, 1883: 13 pp. 1883.

UTAH.

(1) R. of Deseret Agr. and Mfg. Soc. for 1872–'73, Jan. 1, 1874: pp. 5–7. 1874?
(2) R. of Deseret Agr. and Mfg. Soc. for 1875, Feb. 14, 1876: pp. 8–9. 1876.
(3) R. of Supt. of Zion's Fish Assoc'n, 1871–'77, Jan. 1, 1878: 14 pp. 1878?

VERMONT.

(1) R. on propagation of fish, Oct. 22, 1857: 64 pp. 1857.
(2) R. of Cs. to annual session, 1866, Oct. 11, 1866: 35 pp. 1866.
(3) R. of Cs. for the year 1867, Oct. 25, 1867: 25 pp. 1867.
(4) R. of Cs. for the year 1869, Oct. 25, 1869: 16 pp. 1869.
(5) [Biennial] R. of Cs. for the years 1871–'72, Oct. 29, 1872: 20 pp. 1872.
(6) [Biennial] R. of Cs. for the years 1873–'74, Oct. 27, 1874: 80 pp. 1874.
(7) [Biennial] R. of Cs. for [the years] 1875–'76, Oct. —, 1876?: 16 pp. 1876.
(8) Biennial R. of Cs. for 1877–'78, Oct. —, 1878: 24 pp. 1878.
(9) Biennial R. of Cs. for 1879–'80, Oct. 26, 1880: 10 pp. 1880.
(10) Biennial R. of Cs. for 1881–'82, Nov. 15, 1882: 23 pp. 1882.

VIRGINIA.

(1) Report to the Auditor on the oyster beds, &c., Oct. 1, 1871: 21 pp. 1872.
(2) R. of Cs. for the 1875, Dec., 31, 1875?: 34 pp. 1875.
(3) R. of Cs. for the year 1876, Nov. 30, 1876: 13 pp. 1876.
(4) R. of C. for the year 1877, Nov. 20, 1877: 60 pp. 1877.
(5) R. of C. for the year 1878, Nov. 5, 1878: 25 pp. 1878?
(6) R. of C. for the year 1879, Nov. 1, 1879: 23 pp. 1879.
(7) R. of C. on fisheries and oysters, Jan. 28, 1880: 20 pp. 1880.
(8) R. of C. [for three years ending Oct. 1], 1882, Feb. 24, 1883: 31 pp. 1882.

WASHINGTON.

(1) R. of C. [for the year] 1879, Oct. 1, 1879: 4 pp. 1879.

WEST VIRGINIA.

(1) R. of Cs. for the years 1877–'78, Nov. 22, 1878: 28 pp. 1879.
(2) R. of Cs. for the years 1879–'80, Dec. 31, 1880: 16 pp. 1881.
(3) R. of Cs. for the year 1881, Jan. 26, 1882?: 37 pp. 1882.

WISCONSIN.

(1) First R. of Cs. [for year ending Dec. 31, 1874], Dec. —, 1874: 8 pp. 1875.

(2) Second R. of Cs. [for year ending Dec. 31, 1875], Dec. —, 1875: 15 pp. 1875.

(3) Third R. of Cs. for year [ending Dec. 31], 1876, Dec. 21, 1876: 23 pp. 1876.

(4) Fourth R. of Cs. for year ending Sept. 30, 1877, Nov. —, 1877: 23 pp. 1877.

(5) Fifth R. of Cs. for year ending Dec. 31, 1878, Dec. 29, 1878: 46 pp. 1879.

(6) Sixth R. of Cs. for year ending Dec. 31, 1879, Dec. 31, 1879?: 36 pp. 1880.

(7) Seventh R. of Cs. for year ending Dec. 31, 1880, Dec. 29, 1880: 44 pp. 1881.

(8) Eighth R. of Cs. for year ending Dec. 31, 1881, Dec. 31, 1881: 54 pp. 1882.

(9) Ninth R. of Cs. for year ending Dec. 31, 1882, Dec. 31, 1882: 52 pp. 1883.

PUBLICATIONS OF THE AMERICAN FISH-CULTURAL ASSOCIATION.

PROCEEDINGS.

Proceedings | of the | American Fish Culturists' Association. | — | Organized December 20, 1870. | —Albany: | The Argus Company, Printers. | 1872. |

Proceedings | of the | American Fish Culturists' Association | at its Second Annual Meeting, February 11th, 1873. | — | Albany: | The Argus Company, Printers. | 1873. |

Proceedings | of the | American Fish Culturists' Association | at its Third Annual Meeting, | February 10, 1874. | — | Rochester, N. Y. | Evening Express Printing and Engraving Company. | 1874. |

Proceedings | of the | American | Fish Culturists' Association, | at its Fourth Annual Meeting, | February 9 & 10, 1875. | — | Rochester, N. Y. | Evening Express Printing and Engraving Company. | 1875. |

TRANSACTIONS.

Transactions | of the | American | Fish Culturists' Association, | at its Fifth Annual Meeting, | February 8th, 1876. | — | Rutland: | Tuttle and Company, Printers. | 1876. |

Transactions | – | of the | – | American | Fish Culturists' Association. | Special Meeting | Held at the Centennial Exhibition, Philadelphia, October 6th, 1876. | Sixth Annual Meeting, | February 14th and 15th, 1877. | *Seal.* | New York: | John M. Davis, Printer, 40 Fulton Street. | — | 1877. |

TRANSACTIONS—Continued.

Transactions | – | of the | – | American | Fish Cultural Association. | Seventh Annual Meeting, | February 27th and 28th, 1878. | *Held at the Directors' Rooms of the Fulton Market Fish Mongers' Association.* | *Seal.* | New York: | *John M. Davis, Typographer, No.* 40 *Fulton Street.* | 1878. |

Transactions | – | of the | – | American Fish Cultural Association. | Eighth Annual Meeting. | *Held at the Directors' Rooms of the Fulton Market Fish Mongers' Association, in the City of New York.* | February 25th and 26th, 1879. | *Seal.* | New York: | *John M. Davis, Typographer, No.* 40 *Fulton Street.* | —1879. |

Transactions | – | of the | – | American | Fish Cultural Association. | Ninth Annual Meeting, | Held at the Directors' Rooms of the Fulton Market Fish-Mongers' Association, in the City of New York. | May 30th and 31st, 1880. | *Seal.* | New York. | — | 1880. | [John M. Davis, Typographer, No. 40 Fulton Street.]

Transactions | – | of the | – | American | Fish Cultural Association. | Tenth Annual Meeting, | Held at the Directors' Rooms of the Fulton Market Fish Mongers' Association, in the City of New York. | March 30th and 31st, 1881. | *Seal.* | New York. | — | 1881. | [John M. Davis, Typographer, No. 40 Fulton Street.]

Transactions | — of the — | American | Fish-Cultural Association. Eleventh Annual Meeting, | Held at the Directors' Rooms of the Fulton Market Fish-Mongers' Association, in the City of New York. | April 3d and 4th, 1882. | Seal. | — | New York. | 1882. | [John M. Davis, Typographer, No. 40 Fulton Street.]

PUBLICATIONS OF PRIVATE FISH-CULTURISTS.

BOOKS AND PAMPHLETS.

A large number of books and pamphlets by scientists from all portions of the United States, giving results of their observation of aquatic animals, plants, temperatures, tides, currents, and the character of the ocean bottom. (See also supplements to Report of U. S. Commissioner of Fish and Fisheries, reports of State fish commissioners, and practical works on fish culture.)

3. COLLECTIONS.

SPERMARIES AND OVARIES.

(Illustrating the time and place of breeding of important food-fishes.)

SPERMARIES.

HERRING.—*Clupea harengus* Linn.

Spermaries, south head of Grand Manan Island, N. B., Sept. 24, 1872. 10,458. Prof. Spencer F. Baird.

WHITEFISH —*Coregonus clupeiformis* (Mitch.) Milner.

Spermaries (specimen from a fish weighing 2 pounds). Ecorse, Mich., Nov. 15, 1872. 15,216. J. W. Milner.

MENHADEN.—*Brevoortia tyrannus* (Latrobe) Goode.

Spermaries. Noank, Conn., Aug. 24, 1874. 15,217. U. S. Fish Commission.

SWORD-FISH.—*Xiphias gladius* Linn.

Spermaries. Fulton Market, N. Y., July 17, 1874. 16,222. E. G. Blackford. It is doubtful whether this species spawns in American waters, as fish of less than fifty pounds weight are seldom seen on our coast. A "sword" about one inch long was found imbedded in the flesh of a shark taken off Gloucester, Mass., in 1878, but what distance the latter had traveled since it had been attacked by the sword-fish is uncertain.

BONITO.—*Sarda mediterranea* (Schn.) J. & G.

Spermaries. Wood's Holl, Mass., August 4, 1874. 16,312.

HAKE.—*Phycis chuss* (Walb.) Gill.

Spermaries. (Taken from a fish weighing 8 pounds; weight of specimen 8 ounces.) Gloucester, Mass., September 3, 1878. 25,144. R. Edward Earll.

SQUIRREL FISH.—*Diplectrum fasciculare* (C. & V.).

Spermaries. Charleston, S. C., April 2, 1880. 25,426. R. Edward Earll.

HAKE.—*Phycis tenuis* (Mitch.) DeKay.

Spermaries. Off Newport, R. I., August, 1880. U. S. Fish Commission.

OVARIES.

HADDOCK.—*Melanogrammus æglefinus* (Linn.) Gill.

Ovaries. Eastport, Me., 1872. 10,475. U. S. Fish Commission. The haddock spawns along various portions of the New England coast in May. It was first artificially hatched at Gloucester, Mass., in the spring of 1880.

GOOSE FISH.—*Lophius piscatorius* Linn.

Spent ovaries. Eastport, Me., September 6, 1872. 10,476. Prof. Spencer F. Baird.

WHITEFISH.—*Coregonus clupeiformis* Le S.

Ovaries, with a few free eggs. This specimen was taken from a fish weighing $2\frac{3}{4}$ pounds, and is estimated to contain 28,500 eggs. Ecorse, Mich. 10,487. J. W. Milner. The whitefish

WHITEFISH.—*Coregonus clupeiformis* Le S.—Continued.

abounds in all of the Great Lakes, and its spawning-grounds are quite generally distributed. The spawning season lasts from October to January. A 5-pound female is estimated to to yield 25,000 to 30,000 eggs. Not less than 50,000,000 were hatched by the U. S. Fish Commission in the spring of 1883.

WHITEFISH.—*Coregonus clupeiformis* Le S.

Spent ovaries. Ecorse, Mich. 10,489. J. W. Milner.

SISCOWET TROUT.—*Salvelinus namaycush*, var. *siscowet* Ag.

Fragments of ovaries. Specimen estimated to contain 2,796 eggs in a well developed condition. Outer Islands, Lake Superior. 10,493. This species spawns in the shore-waters of the Great Lakes, Lake Superior containing the most important spawning-grounds.

MACKINAW TROUT.—*Salvelinus namaycush* (Penn.) Goode.

Ovaries. This specimen, which is estimated to contain 14,943 eggs, was taken from a fish weighing 24 pounds. Shoal Islands, Lake Superior. 10,495. James W. Milner. This species breeds in the waters of the Great Lakes where it is quite abundant. The spawning season begins in October and lasts till the middle of November. Fish of average size will yield from 2,000 to 10,000 eggs, which, in water of 38° Fahr., will hatch in 70 to 80 days.

MUMMICHOG.—*Fundulus pisculentus* (Mitch.) Val.

Ovaries. Wood's Holl, Mass., June 5, 1872. 10,505.

TAUTOG.—*Tautoga onitis* (Linn.) Günther.

Ovaries. Wood's Holl, Mass., July 5, 1872. 10,516. Vinal N. Edwards. This species spawns on the rocky ledges off the coast of Southern New England and New Jersey during the summer months.

STRIPED SEA-ROBIN.—*Prionotus evolans* (Linn.) Gill.

Ovaries. Wood's Holl, Mass., May 25, 1872. 10,530. Vinal N. Edwards. This species spawns in various portions of the Atlantic coast, between Cape Cod and Florida, in summer.

SCUP, or SCUPPAUG.—*Stenotomus chrysops* (L.) Bean.

Ovaries. Wood's Holl, Mass., June, 1872. 10,531. Vinal N. Edwards. The principal spawning grounds of this species are along the coast of Southern New England.

SEA-BASS.—*Centropristis nigricans.*

Ovaries. Wood's Holl, Mass., May 26, 1872. 10,532. Vinal N. Edwards. This species spawns on the coral banks and rocky ledges of the Atlantic coast, some miles from shore, in spring. The spawning grounds extend from the Carolinas to Cape Cod.

SPRING ALEWIFE.—*Clupea vernalis* Wilson.

Ovaries. Wood's Holl, Mass., April, 1871. 10,615. Vinal N. Edwards. Immense schools of this species ascend the larger rivers of the Atlantic coast in springs for the purpose of spawning. The principal spawning-grounds are in the tributaries of Delaware and Chesapeake Bays, and Albemarle and Pamlico Sounds.

COD.—*Gadus morrhua* Linn.

Ovaries. Wood's Holl, Mass., April 20, 1871. 10,616. Vinal N. Edwards. The spawning-grounds of the codfish off our own coast extend as far south as Central New Jersey. The principal spawning-grounds are off the coasts of Maine and Massachusetts and on the more distant fishing banks. Ripe fish may be seen at any time between September and the following May, though the height of the spawning season occurs in mid-winter. The number of eggs in a fish varies with the size of the parent—a 75-pound female containing about 9 millions. The eggs hatch in from 13 to 50 days, according to the temperature of the water. They are $\frac{1}{19}$ of an inch in diameter, and have a specific gravity slightly less than that of sea-water.

COMMON FLOUNDER.—*Pleuronectes americanus* Walbaum.

Ovaries. Wood's Holl, Mass., April 3–5, 1876. 15,186. U. S. Fish Commission. The spawning-grounds for this species on the coast extend from Maine to Cape May, or perhaps even farther south. The spawning season occurs during the summer months.

SAND FLOUNDER.—*Bothus maculatus* (Mitch.) J. & G.

Ovaries. Wood's Holl, Mass., June. 15,187. Vinal N. Edwards. This species spawns in summer along the coast of Southern New England and New Jersey.

TOMCOD.—*Microgadus tomcod* (Walb.) Gill.

Ovaries. Wood's Holl, Mass., January 10, 1874. 15,191. U. S. Fish Commission. This species spawns in the salt and brackish waters of the New England coast in mid-winter.

SEA-RAVEN.—*Hemitripterus hispidus* (Schn.) Goode.

Ovaries. Casco Bay, Me., August 25, 1872. 15,203. U. S. Fish Commission. This species spawns in the shoal waters of New England in the fall.

MACKEREL.—*Scomber scombrus* Linn.

Ovaries. Wood's Holl, Mass., May 20, 1875. 15,205. U. S. Fish Commission. This species spawns off the New Jersey and New England coast in spring and early summer.

BONITO.—*Sarda mediterranea* (Schn.) J. & G.

Ovaries. Noank, Conn., July 25, 1874. 15,208. U. S. Fish Commission. The fishermen of Sandy Hook report that the bonito spawns in that locality during the summer months, as ripe fish are often taken by them at that season.

BLUEFISH.—*Pomatomus saltatrix* (Linn.) Gill.

Ovaries. Wood's Holl, Mass., June 18, 1874. 15,209. U. S. Fish Commission. The New Jersey fishermen, as well as those of Southern New England, report ripe fish of this species occasionally taken by them during the summer months. The young occur almost everywhere along the coast between Cape Cod and Florida. From these facts it seems probable that the bluefish spawn a considerable distance from the shore during the summer months.

BUTTERFISH.—*Stromateus triacanthus* (Peck.) J. & G.

Ovaries. Wood's Holl, Mass., May 20 to June 8. 15,210. Vinal N. Edwards. This species spawns along the outer shores and in the salt-water bays lying between Cape Cod and Cape Henlopen, the more important spawning-grounds being along the coast of Southern New England.

KINGFISH.—*Menticirrus nebulosus* (Mitch.) Gill.

Ovaries. Wood's Holl, Mass., May 25, 1874. 15,211. Vinal N. Edwards. The principal spawning-grounds for this species are off the coast of Southern New England and New Jersey, although the species undoubtedly spawns as far south as the Carolinas. The spawning season occurs in summer.

SQUETEAGUE.—*Cynoscion regalis* (Bloch.) Gill.

Ovaries. Wood's Holl, June 7–10, 1875. 15,212. Vinal N. Edwards. This species spawns in the salt and brackish water sounds and bays, and along the outer shore of the Atlantic coast, between Cape Cod and Florida, from April to July.

HERRING.—*Clupea harengus* Linn.

Ovaries. Wood's Holl, Mass., Oct., 1872. 15,221. Vinal N. Edwards. The principal spawning-grounds for this species within the limits of the United States are Passamaquoddy Bay, Boisbubert Island, Penobscot Bay, and Wood Island, off the coast of Maine; and near Cape Ann, on the Massachusetts coast. The spawning season varies greatly with the locality.

SHARP-NOSED STURGEON.—*Acipenser oxyrhynchus* Mitch.

Ovaries. Block Island, August 2, 1874. 15,224. U. S. Fish Commission. This species spawns in the larger rivers of the Atlantic slope during the spring and early summer. During the spawning season great numbers of them are taken by the fishermen, who fish for them exclusively during several months.

SHORT-NOSED STURGEON.—*Acipenser brevirostris* Le S.

Ovaries. Noank, Conn., July 25, 1874. 15,225. U. S. Fish Commission. This species visits the larger rivers tributary to the Atlantic between Cape Cod and Florida for the purpose of spawning. The spawning season begins in March in the south and closes about the 1st of August in Southern New England.

GAR-PIKE—*Lepidosteus osseus* (Linn.) Ag.

Ovaries. Potomac River, Washington, D. C., May 20, 1875. 15,461. J. W. Milner. This species has a wide geographical range, and probably spawns in all of the larger rivers of the Mississippi basin, as well as those of the Atlantic coast.

GOOSE-FISH.—*Lophius piscatorius* Linn.

Ovaries. Wood's Holl, Mass., July 2, 1875. 16,104. Gelatinous masses, 20 to 30 feet long and 2 or 3 feet wide, in which are imbedded the eggs of this species, are found floating at the surface of the New England waters in midsummer.

DRUM.—*Pogonias chromis* La Cép.

Spent ovaries. Fulton Market, N. Y., July 23. 16,221. E. G. Blackford. The principal spawning grounds for this species occur in the salt and brackish waters of the coast between Maryland and Georgia, although the species undoubtedly breeds beyond these limits.

COBIA, or CRAB-EATER.—*Elacate canada* (Linn.) Gill.

Fragment of ovary. New York Market, July 30, 1875. 16,283. E. G. Blackford. A number of females with the eggs well advanced were taken in Chesapeake Bay June 30, 1880. The species probably spawns along the coast from New Jersey to South Carolina in summer.

MUD-FISH.—*Amia calva* Linn.

Ovaries. September 30, 1875. 20,527. The mud-fish spawns in the fall in the fresh-water streams of many portions of the United States.

BURBOT.—*Lota maculosa* (Le S.) Rich.

Ovaries. Seneca Falls, N. Y., Nov., 1877. 20,847. E. G. Blackford. This species is said to spawn in the great lakes and their tributaries in the fall.

SMOOTH FLOUNDER.—*Pleuronectes glaber* (Stor.) Gill.

Ovaries. Portland, Me., December 15, 1877. 20,873. Dr. Tarleton H. Bean. This fish spawns in midwinter off the New England coast.

SILVER HAKE.—*Merlucius bilinearis* (Mitch.) Gill.

Ovaries. Halifax, Nova Scotia, September 8, 1877. 21,016. U. S. Fish Commission.

COW-NOSED RAY.—*Rhinoptera quadriloba* (Le S.) Cuv.

Uterus after young has been removed. Pensacola, Fla., April. 21,221. Silas Stearns. This ovoviviparous species breeds along the Southern Atlantic coast and in Gulf of Mexico, in the spring and early summer.

MENHADEN.—*Brevoortia tyrannus* (Latrobe) Goode.

Ovaries. August 18, 1878. 25,133. Until recently little or nothing was known regarding the spawning habits of this species. August 18, 1878, several ripe females were taken off the coast of Rhode Island. It is claimed by the fishermen of Virginia and the Carolinas that the species spawns off that portion of the coast from December to March. Young menhaden, an inch or more in length, are very abundant in the shore waters between Sandy Hook and Cape Cod in midsummer.

POLLOCK.—*Pollachius virens* (Linn.)

Ovaries. Noman's Land, November 21, 1877. 25,137. Vinal N. Edwards. The spawning grounds of this species off our coast extends from Cape Cod to New Brunswick. The spawning season begins about the middle of May and lasts till the middle or last of November.

ROCK.—*Roccus striatus* Mitchill.

Wood's Holl, Mass., 1876. 25,139. Ovaries. Vinal N. Edwards. This species spawns in spring in the bays and lower river-courses of the Atlantic coast.

TOAD-FISH.—*Batrachus tau* Linn.

Ovaries. Wood's Holl, Mass. 25,142. Vinal N. Edwards. Ripe toad-fish were taken in Chesapeake Bay, June 1, 1880. It is probable that the species spawns along all portions of the Atlantic coast during the summer months.

SWELL-FISH.—*Tetrodon turgidus* Mitchill.

Ovaries. Wood's Holl, Mass., July 1, 1877. 25,147. Vinal N. Edwards. This species spawns along the outer Atlantic coast in the spring and early summer. Ripe females are frequently taken in Virginia in June, and in the Long Island region in July.

WHITING.—*Menticirrus alburnus* (Linn.) Gill.

Ovaries. (Specimen taken from a fish 12 inches long.) Charleston, S. C., May 26, 1880. 25,420. R. Edward Earll. This species spawns in the bays and along the outer shore between Cape Hatteras and Florida. The height of the spawning season at Charleston, S. C., occurs in April and May.

SQUIRREL-FISH.—*Diplectrum fasciculare* (C. & V.).

Ovaries. Charleston, S. C., April 2, 1880. 25,426. R. Edward Earll. This species spawns on the coral banks off the South Carolina coast in May. Not found elsewhere in our waters in any considerable numbers.

"BASTARD SNAPPER."—*Sparus pagrus* L.

Ovaries. (Specimen taken from an immature female weighing 3½ pounds and measuring 18 inches to end of tail.) Charleston, S. C., April 2, 1880. 25,427. R. Edward Earll. Spawning grounds for this species occur off the Carolina coast, this being the only locality within our borders where the bastard snapper is taken. The season for spawning lasts from April to June. The eggs when impregnated are about one twenty-fourth of an inch in diameter.

SILVERY HAIR-TAIL.—*Trichiurus lepturus* Linn.

Ovary. Charleston, S. C., April 2, 1880. 25,428. R. Edward Earll. This species spawns off the Carolinas in April and May. Ripe females are frequently seen at Charleston, S. C., during the month of April.

BLACK-TAILED PORGY.—*Diplodus holbrookii* (Bean).

Ovaries. (Specimen from a fish weighing three-fourths of a pound.) Charleston, S. C., March 29, 1880. 25,522. This species spawns in April on the coral-banks off the Carolina and Georgia coasts, where it is more abundant than in any other locality.

EEL-POUT.—*Zoarces anguillaris* (Peck) Storer.

Ovaries. Gloucester, Mass., August 1, 1878. U. S. Fish Commission. This species spawns off the New England coast in August and September.

HAKE.—*Phycis chuss* (Walb.) Gill.

Ovaries. (Specimen from a fish 17 inches long.) Newport, R. I., September, 1880. U. S. Fish Commission. This species spawns off the coast of Maine and Massachusetts in September and October.

HAKE.—*Phycis tenuis* (Mitch.) DeKay.

Ovaries. Off Newport, R. I., 1880. U. S. Fish Commission. This species spawns in September and October off the New England coast.

HALIBUT.—*Hippoglossus vulgaris* Fleming.

Fragment of ovary. (Weight of specimen, one-half pound, Troy. Taken from a 175-pound fish, the entire ovaries of which weighed 17 pounds 2 ounces avoirdupois.) Grand Banks, September 17, 1878. Capt. Joseph W. Collins. Little is known of the spawning habits of this species, but from the observations of the fishermen it is supposed to spawn on the rocky bottom of the more important fishing banks north of latitude 44° N., in from 75 to 100 fathoms of water, in the fall and early winter. The eggs are thought to be adhesive, though there is still some doubt on the subject. The number of eggs in a fish varies with the size of the latter. The one from which this specimen was taken was estimated to contain about 2,250,000 eggs.

LAMPREY.—*Petromyzon marinus* Linn.

Ovaries. May 15, 1872. This species is said to spawn off the New England coast in spring; but little is known regarding its spawning habits.

MOON-FISH.—*Chætodipterus faber* (Cuv.) Jor. & Gilb.

Ovary. Crisfield, Md., July 1, 1880. R. Edward Earll. Important spawning grounds for this species are located in Chesapeake Bay, where ripe fish are taken in great numbers during the summer months. It probably spawns in various other localities between Cape Cod and Florida, as well as in the Gulf of Mexico. The eggs are one twenty-eighth of an inch in diameter, and in water of 80° Fahr. hatch in less than twenty-four hours.

SHAD.—*Clupea sapidissima* Wilson.

Ovaries. (This specimen taken from a fish 20 inches long, weighing 4½ pounds.) Winyah Bay, Georgetown, S. C., March 29, 1880. R. Edward Earll. The shad is one of the most important food-fishes of the United States. It spawns in all of the larger rivers of the Atlantic coast, the principal spawning grounds being located near their headwaters. The fish make their appearance in Florida about the 1st of January. They enter the North Carolina rivers in March, and reach southern New England about the middle of May. The spawning season depends largely on the temperature of the water. In Florida the height of the season is in the month of February. In North Carolina the ripe fish are seen in greatest numbers in April. In New England the season begins about the last of May and continues till the middle of July.

SPANISH MACKEREL.—*Scomberomorus maculatus* (Mitch.) J. & G.

Ovaries. (Specimen taken from a fish 19½ inches long, weighing 34 ounces.) Crisfield, Md., June 28, 1880. R. Edward Earll. This species is known to spawn in the coastal waters between Long Island Sound and North Carolina in summer, and it is probable that it breeds as far south as the Gulf of Mexico. The principal spawning grounds are in the vicinity of Sandy Hook, N. J., and in Chesapeake Bay. The eggs average about one twenty-eighth of an inch in diameter, and in water of 80° Fahr. hatch in eighteen to twenty hours. Their specific gravity is slightly less than that of salt water. An average sized female produces during the season from 500,000 to 750,000 eggs, though as these are deposited at intervals during several months, the number that can be taken at one time for hatching purposes seldom exceeds 100,000.

SPOTTED SQUETEAGUE.—*Cynoscion maculatum* (Mitch.) Gill.

Ovaries. (Specimen taken from female 18 inches long, weighing 2 pounds 1 ounce.) Crisfield, Md., June 30, 1880. R. Edward Earll. This species spawns in the shoal water of the brackish sounds and bays along the Carolina coasts in May and June, and in the upper portions of Chesapeake Bay in June and July. The principal spawning grounds are on the Carolina coast.

PLAICE.—*Paralichthys dentatus* (Linn.) J. & G.

Ovaries. Wood's Holl, Mass., January 15, 1874. 14,140. Collected by Vinal N. Edwards. This species spawns along the New England coast and northward in winter.

GRAY PIKE.—*Stizostedium canadense* (Smith) Jordan.

Ovaries. Memphis, Tenn.

COMMON SMELT.—*Osmerus mordax* (Mitch.) Gill.

Fish showing ovaries in position. Raritan River, N. J., April 6, 1875. 15,232. J. R. Shotwell. This species enters the fresh and brackish waters of the New England coast in the fall and early winter for the purpose of spawning, the principal spawning-grounds being along the coast of Maine and Massachusetts.

LUMP-FISH.—*Cyclopterus lumpus*, Linn.

Spent ovaries. Eastport, Me., September 13, 1872. 10,471. The lump-fish spawns among the rocky ledges and algæ beds of the New England coast during the winter months. The eggs are adhesive, and bunches of them weighing a pound or more are often washed upon the beach during heavy gales. Bunches of naturally impregnated eggs have been taken and hatched out in floating boxes by the U. S. Fish Commission.

C.—PROTECTION.

III.—Legislation.

4. Fishery laws. (See Reports.)

IV.—Assistance to fish in reaching spawning-grounds.

5. Fish-ways.

POOL FISH-WAYS.

(Ascent made by alternate rapid currents and pools, the latter serving as resting-places for the fish).

a. POOLS FORMED BY NATURAL IRREGULARITIES OF THE CHANNEL.

DUNCANNON FISH-WAY.

Model of fish-way built at Duncannon, Pa., in which the velocity of the current is retarded by means of rocks and bowlders so arranged as to form a series of pools at different points in the sluice. Designed by J. T. Rothe, Duncannon, Pa. 25,701.

b. POOLS CONSISTING OF A SERIES OF PONDS OR COMPARTMENTS.

SHAW'S SPIRAL FISH-WAY.

In this fish-way the water passes by a series of vertical falls through openings in the several rectangular compartments on its way to the lower level. The width of the opening is about one-fourth of the longer side of the box. The extent of the fall varies with the number of compartments and the height of the dam. The compartments are arranged spirally. A gate at the top (not shown in the model) regulates the quanity of water used. Each compartment is provided with an opening at the bottom to admit of drainage in winter. Designed by B. F. Shaw, of Anamosa, Iowa. 39,497.

c. POOLS FORMED BY PARTITIONS PLACED AT AN ANGLE WITH THE SIDE OF THE SLUICE.

SWAZEY'S OBLIQUE FISH-WAY.

Old style. In this fish-way the partitions extend alternately from either side, sloping upward at an angle of 45° to a point slightly beyond the center of the sluice to form pockets or pools, which serve as resting-places for the fish. In passing through the way the water is caught in the angle formed by

SWAZEY'S OBLIQUE FISH-WAY—Continued.

the partition and the side of the chute and turned backward in its course. By this arrangement the velocity of the current is greatly reduced. Scale: One fourth of an inch to the foot ($\frac{1}{48}$). Invented by Alfred Swazey, of Bucksport, Me., in 1874. 29,289. Model by C. G. Atkins.

SWAZEY'S OBLIQUE FISH-WAY.

New style. Model of an inclined-plane fish-way in which the partitions, which extend entirely across to the chute at right angles to it, are placed at an angle with the perpendicular, thus forming a pocket or pool which retards the velocity of the current. The tops of these partitions slope downward, the lower end of the adjoining ones being on opposite sides of the sluice, so that the water in descending is made to travel back and forth across the way as many times as there are separate compartments. Scale: One-fourth of an inch to the foot ($\frac{1}{48}$). Designed by Alfred Swazey, of Bucksport, Me., in 1876. 29,288. Model by C. G. Atkins.

d. POOLS FORMED BY EDDIES IN THE CURRENT.

WORRALL'S EXPANDING-SLUICE FISH-WAY.

Model of fish-way built in the Susquehanna River at Columbia, Pa., in 1866, showing the arrangement by which the floor or channel is widened, the object being to create eddies to serve as resting-places for the fish. This fish-way, which is 45 feet long, is set into the masonry of the dam so that its base is in line with the dam wall. It is 20 feet wide at the top, gradually increasing to 40 feet at the bottom. The dam is 6 feet high, and the velocity acquired by the current in descending the sluice is said to be less than 10 miles per hour. Scale: One-eighth of an inch to the foot ($\frac{1}{96}$). Designed by James Worrall, of Pennsylvania. 29,284. Model by C. G. Atkins.

CHUTE OR TROUGH FISH-WAYS.

(In which the ascent is so gradual that the fish succeed in overcoming the current).

WORRALL'S CHUTE FISH-WAY.

Model of fish-way built in the Susquehanna River, at Columbia, Pa., in 1873. It consists of a straight sluice-way, 120 feet long and 60 feet wide, made of crib-work and filled with stone. The fall is about 1 foot in 35, and the velocity acquired in the descent is said to be less than 10 miles per hour. Scale: One-eighth of an inch to the foot ($\frac{1}{96}$). Designed by James Worrall, of Pennsylvania. 29,284 (?). Model by C. G. Atkins.

DEFLECTED CURRENT FISH-WAYS.

(In which the current is retarded by being made to travel through a distance equal to many times the length of the way in descending, being frequently interrupted by objects placed in the course, causing a change in its direction).

a. ZIGZAG-CURRENT FISH-WAYS.

BREWER'S SINGLE-GROOVE FISH-WAY.

This fish-way consists of a straight chute with a series of equilateral triangles extending transversely from either side along the bottom, the spaces between them forming a zigzag channel through which the water passes to the lower level. The angular turns, which change the direction of the current, serve to retard the downward movement of the water. This fish-way evidently works best when there is little more than enough water to fill the groove. Patented April 30, 1872, by James D. Brewer, of Muncy, Pa. Model by James D. Brewer. 15,355.

STECK'S DOUBLE-GROOVE FISH-WAY.

This fish-way consists of a straight chute, with irregularly sloping floors, which serve to retard the water in its descent. The floors are so arranged that the main current at the center is repeatedly broken up to form two smaller ones, which, after being deflected toward the sides, are brought together again at a lower point. Patented by Daniel Steck, of Pennsylvania. 26,107.

b. TRANSVERSE-PARTITION FISH-WAYS.

STECK'S FISH-WAY.

In this fish-way the velocity of the water is retarded by transverse partitions extending alternately from either side four-fifths of the distance across the sluice. The descent is made by means of transverse sloping floors. By this arrangement the fish-way is practically cut up into a series of straight open sluices, the upper end of one being on a level with the lower end of the next preceding one. The length of the fish-way is greatly reduced by the parallel arrangement of the sluices. Designed and patented by Daniel Steck, of Pennsylvania. 26,108. Model by James D. Brewer.

SMITH'S INCLINE-PLANE RETURN FISH-WAY.

In this fish-way the water is carried through half of the perpendicular height in an ordinary sluice or chute, leaving a level floor with steps at regular intervals. In descending through the sluice the water acquires considerable velocity, which is overcome by a series of rectangular compartments, the partitions

SMITH'S INCLINE-PLANE RETURN FISH-WAY—Continued.

of which interrupt the current and turn it in its course. The floor of each alternate compartment is paved with stones, to render them more attractive to the fish, and to afford resting places while descending the fish-way. Scale: Three-eighths of an inch to the foot ($\frac{1}{32}$). Designed by Everett Smith, Portland, Me. 42,944. U. S. Fish Commission.

LAWRENCE FISH-WAY.

Model of Brackett's patent rectangular compartment fish-way on the inclined-plane system, built in the Merrimac River at Lawrence, Mass. Scale: One-eighth of an inch to the foot ($\frac{1}{96}$). Designed and patented by E. A. Brackett, of Massachusetts. Model by by C. G. Atkins. 26,939. The first section of this fish-way is so arranged that it can be raised, thus entirely shutting off the water at time of freshets or at seasons when the way is not needed.

HOLYOKE FISH-WAY.

Model of fish-way built in the Connecticut River at Holyoke, Mass. This is a rectangular compartment fish-way on the inclined plane system, the peculiarity of this way being the submerged piece of cob-work placed in the river to direct the fish to the foot of the fish-way. Scale: One-eighth of an inch to the foot ($\frac{1}{96}$). Patented by E. A. Brackett, of Winchester, Mass. 26,937. Model by C. G. Atkins. The dam at Holyoke is 30 feet high. The total height of the fish-way is 440 feet, giving a fall of 1 foot in 15. It is said to carry a column of water 2 feet wide and 2 feet deep through the entire distance without perceptible increase in velocity, the current at the lower end being less than 10 miles per hour.

EVERLETH'S SELF-ADJUSTING FISH-WAY.

This is an ordinary rectangular compartment fish-way on the inclined plane system, the upper end of which is provided with a movable float that rises and falls with the fluctuations of the river. By this arrangement the entrance of the fish-way is always kept at the proper height to admit the required quantity of water. Scale: One-fourth of an inch to the foot ($\frac{1}{48}$). Designed by Dr. F. M. Everleth, of Waldoborough, Me. 26,930. Model furnished by C. G. Atkins.

ATKINS'S INCLINE-PLANE RETURN FISH-WAY.

In this model is shown the modification of the incline-plane fish-way for delivering the water at the foot of the dam. It is provided with gates for regulating the supply of water, and shows the

ATKINS'S INCLINE-PLANE RETURN FISH-WAY.—Continued.

arrangement of partitions in the rectangular compartments for preventing an increase in velocity. Scale: One-half inch to the foot ($\frac{1}{24}$). Designed by Charles G. Atkins, Bucksport, Me. 29,291.

PIKE'S SPIRAL FISH-WAY.

This is the first spiral fish-way invented in America. In it the compartments are modified into long and narrow sluices. The floors are level, the descent being by means of short vertical falls or steps which occur at regular intervals. The velocity of the water is retarded by frequent changes in the direction of the current and by the contracting of the sluices, which are much narrower at their lower than at their upper ends. In making one circuit of the way the water traverses seven sluices, or a total of 68 feet, passing over fourteen steps, which give a total of 42 inches for each current. Scale: One-half inch to the foot ($\frac{1}{24}$). 26,931. Great economy of space and material is effected by the spiral arragement, and the outlet of the fish-way naturally comes at the foot of the dam, where the fish can readily find it.

ATKINS'S SPIRAL FISH-WAY.

Model of rectangular compartment fish-way on the inclined-plane system, in spiral arrangement, in imitation of Pike's spiral fish-way. Scale: One-half inch to the foot ($\frac{1}{24}$). Designed by C. G. Atkins, of Bucksport, Me. 26,949. U. S. Fish Commission. This fish-way, which is provided with sluices of different heights, can be worked satisfactorily at all seasons, as the river water of any level can be utilized. Each sluice is provided with gates by means of which the quantity of water can be easily regulated. In this model the sides of the fish-way are made of glass, in order that the interior may be more readily seen.

BANGOR FISH-WAY.

(Model of the fish-way in the Penobscot River at Bangor, Me.) This is a rectangular compartment fish-way on the inclined-plane system, spirally arranged. Its peculiarities are: A large supply-trough, provided with numerous gates, by means of which water at different levels, can be utilized, and the arrangement of the partitions for retarding the velocity of the current. The abutments which protect it from the ice are also very effective Height of dam, 16 feet. Scale: Three-eighths of an inch to the foot ($\frac{1}{32}$). Designed by Charles G. Atkins, of Bucksport, Me. 39,306. Built by the city of Bangor, in 1877, at a cost of $6,000.

COUNTER-CURRENT FISH-WAYS.

THE McDONALD FISH-WAY.

Working model. Scale, one-twelfth. This fish-way, invented by Col. Marshall McDonald, of the U. S. Fish Commission, in 1878 (patented September 24, 1878, August 5, 1879), differs in principle from all previously invented or used, the water being delivered down a straight sluice-way, inclined at an angle of 30°, and without acceleration of velocity. "This is accomplished by compelling each particle of water to traverse a constrained path, the final direction being against gravity, the retardation by friction bringing the particle to rest at a lower level in the way. A reference to the model will show the mechanical means by which this is accomplished. The bottom of the way is hollow; each of the center openings communicates with the openings on each side corresponding to the fourth side-intervals below. A particle of water entering any one of the middle openings passes under the hollow floor and returns to the surface of way through the fourth opening below, its final direction being up the slope and against gravity, which soon brings the particle to rest, when it falls again towards the middle of the way, sinks into one of the center openings and traverses a similar circuit; this is repeated again and again until finally the particle of water reaches the bottom of the way with no greater acceleration than it received in its first circuit. It is evident, then, that the maximum velocity of the current of water in the fish-way can never be as great as the maximum velocity of each particle of water that makes the current. The maximum velocity of each individual particle is under absolute control, being in proportion to the difference of level between its consecutive points of rest; we may therefore deliver the water down the way with a uniform velocity which shall not exceed any maximum limit desired. The fish-way is sheltered from floods and floating ice or timber by being placed behind the abutment of a dam. Water is brought from the dam to the head of the fish-way by a conduit of boards supported by trestling; this conduit may, however, be built of masonry or of iron. This represents only one of a number of designs that may be adopted to suit best the varying conditions of locality. To test the fish-way practically, turn on, at the head, enough water to keep the box full. Place young trout in the pool at the foot of the fish-way, and after they have become accustomed to their surroundings, they will swim readily up the way, moving as quickly as the eye can follow them. For details of construction, see working-drawings of design for James River fish-ways." —*M. McDonald.*

McDONALD FISH-WAY.

Photograph of the falls at Fredericksburg, Va., showing the McDonald fish-way in position behind the abutment. Size, 8 by 10 inches. Fredericksburg, Va., 1882. 2,244. U. S. Fish Commission.

McDONALD FISH-WAY.

A photograph of the Falls at Fredericksburg, Va., showing the McDonald fish-way in position behind the abutment. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Fredericksburg, Va., 1882. 2,244. U. S. Fish Commission.

V.—PURIFICATION OF STREAMS.

6. CLEANSING RESIDUUM FROM MANUFACTURING ESTABLISHMENTS, ETC., BEFORE IT ENTERS THE RIVERS.

GAS-WORKS.

Drawings illustrating the method of purifying the residuum of gas-works before allowing it to pass off into the river. Description of apparatus, with letter of explanation to Prof. S. F. Baird, by J. R. Shotwell.

D.—ARTIFICIAL PROPAGATION.

VI.—Apparatus for the manipulation of eggs and young fish.

7. Hatching apparatus and accessories.

APPARATUS FOR HEAVY EGGS—TROUGH APPARATUS.

a. APPARATUS WITH A HORIZONTAL CURRENT.

GARLICK'S HATCHING-BOX.

A simple trough, the bottom of which is covered with pebbles, on which the eggs remain until hatched, the water entering through a spout above and passing out through an opening protected by wire cloth at the lower end. Length, 18 inches; width, 9 inches; depth, 6½ inches. Invented by Theodatus Garlick, Cleveland, Ohio, 1851. Presented by Theodatus Garlick. 39,498. This is the first form of hatching apparatus used in the United States. It was adopted by Dr. Garlick, who may justly be called the father of fish-culture in America. Though simple, the results obtained by its use were very satisfactory.

SLACK'S HATCHING-GRILL.

A series of rectangular boxes arranged in flights so that the water passes readily from the highest through the intervening ones to the lowest. Each box is provided with a tray composed of glass tubings incased in a wooden frame, which contains the eggs. Length, 21 inches; width, 7 inches; depth, 4½ inches. Designed by J. H. Slack, of Bloomsbury, N. J., in imitation of Coste's hatching-grill. U. S. Fish Commission. 57,158. The water enters from the top near one corner, and after passing through the box, goes out through the spout at the opposite diagonal corner. The glass tubes are advantageously employed in hatching, as by their use the eggs are less liable to be injured from fungus or sediment.

STONE'S PARLOR HATCHING-TROUGH.

A rectangular box with a glass cover, inclosing a smaller box with a double bottom. The inner box contains three screens, two of which are covered with cloth to serve as filters, the other being of wire cloth for keeping the fish from escaping through the outflow pipe. Outer box, 18 inches long, 5 inches wide, and 5 inches deep. Devised by Livingston Stone, of Charleston, N. H. Presented by Livingston Stone. 39,463. The up-

STONE'S PARLOR HATCHING TROUGH.—Continued.

per and lower bottoms slope in opposite directions. The water enters through an opening in the glass, passing over the cleats, which serve as resting places for the fish, to the lower end, and after passing through a small hole, follows the lower bottom to the opposite end, where it escapes through the outflow pipe.

BUCKSPORT HATCHING-TROUGH.

A section of hatching-trough showing two compartments complete, with nests of trays. Each compartment contains a frame which is closed when in use, but can be opened for convenience in removing them. Length, 31 inches; width, 15 inches; depth, 17 inches. Employed by Charles G. Atkins, of Bucksport, Me., for hatching eggs of various species of salmonidæ. Charles G. Atkins. 26,936.

ATKINS'S HATCHING-TRAY.

Photograph showing a nest of hatching-trays, devised by Charles G. Atkins, for use in hatching eggs of the Atlantic salmon. These trays are placed in troughs and a current of water is allowed to pass through them horizontally. Size, 8 by 10 inches. Bucksport, Me., 1882. (762). 2,221. U. S. Fish Commission.

HATCHING-APPARATUS.

Photograph of the apparatus employed in hatching eggs of the Atlantic salmon at the hatchery of the U. S. Fish Commission at Buckport. Size, 8 by 10 inches. Bucksport, Me., 1882. (753) 2,214. U. S. Fish Commission.

ATKINS'S HATCHING-CRATE.

A frame of metal and wood, with hinged cover, which incloses a nest of nine egg-trays. Length, 12 inches; width, 12 inches; depth, 7 inches. Designed by Charles G. Atkins, of Bucksport, Me. Presented by Charles G. Atkins. 26,935. This crate is used chiefly for hatching eggs of the salmonidæ. The trays are provided with corner strips of wood, which separate them slightly from each other to allow free circulation of water, though the spaces are not large enough to allow the escape of eggs. These crates can be placed either in the open stream or in ordinary troughs.

b. APPARATUS WITH AN UPWARD CURRENT.

HOLTON HATCHING-BOX.

A square wooden box, with a tin bottom sloping downward and inward toward the center, where the inflow opening is situated.

HOLTON HATCHING-BOX—Continued.

Just above this is a rectangular piece of tin, against which the water impinges as it enters, thus being deflected toward the sides. The box is provided with eleven trays of wire cloth, each separated from the other by the wooden frame to which it is attached. Eighteen inches square and 12 inches deep; outside measurement, including base and waste trough, 22 inches square and 20 inches deep. Patented by Marcellus G. Holton, Rochester, N. Y., March 18, 1873. U. S. Fish Commission. 57,159. The water enters the buckets through a tube which extends from the top around the side to the inflow opening at the bottom center, from which it passes up through the trays of eggs into a trough at the top, which conducts it to the outflow spout. This is one of the first forms of apparatus by which an upward current of water is utilized, and the inventor claims for it many advantages over other systems. These boxes are often so arranged that the water passes through a series of twenty or more, each box being a trifle lower than the preceding one, and the outflow of the first communicating with the feed-pipe of the second.

STONE'S SALMON-BASKET.

This apparatus consists of a Williamson trough provided with wire baskets, suspended from frames, for holding the eggs. Designed by Livingston Stone, Charleston, N. H., 1874. Livingston Stone. 26,956. In this apparatus a double partition separates each compartment, the first, or upper one, extending to the bottom, while the second one is placed a little way above it. The water falls over the first partition and passes under the second into the compartment, then upward through the basket of eggs and over between the next partitions. This was one of the first forms of apparatus for bulk hatching in the United States, and, according to Mr. Stone, the eggs were often placed 12 to 15 layers deep without injury.

FERGUSON HATCHING-JAR.

A cylindical jar of glass, with a contraction near the base, which serves as a support to the 7 wire-cloth egg-trays which it contains. It has two circular openings on opposite sides; one at the bottom for admitting the water, which passes upward through the eggs and out through the second opening, which is situated at the top. Height, 12 inches; diameter, 8 inches. Invented by T. B. Ferguson in 1876. U. S. Fish Commission. 26,998. For economy of water, the outflow opening of one jar is connected with the inflow pipe of the next by means of rubber tubing. By this means the water passes through an entire

FERGUSON HATCHING-JAR—Continued.

series of jars before it finally escapes. The jar is used chiefly for hatching eggs of the salmonidæ. It holds about 4,000 salmon eggs or 6,000 trout eggs.

c. APPARATUS WITH A DOWNWARD CURRENT.

CLARK'S HATCHING-TROUGH.

Model. A section of the Clark hatching-trough, supported on wooden standards, showing two compartments complete. Each compartment contains a hatching-box, the bottom of which is perforated with holes and raised slightly above the bottom of the trough by means of wooden standards to allow the escape of water from beneath. Each hatching-box contains 12 trays of wire cloth, on which the eggs remain during their development. Compartments, 15 inches long, 12 inches wide, 12 inches deep—inside measurement. Hatching-boxes, 13½ inches long, 12 inches deep, and 11 inches wide—outside measurement. Trays, 12 inches long, 9 inches wide, and ¾ of an inch deep. Patented by Nelson W. Clark, Clarkston, Mich., March 3, 1874. Presented by Frank W. Clark. 42,812. A Clark trough usually contains 10 to 20 compartments, each being separated from the adjoining one by means of a partition, which is notched at the center and provided with a tin spout for conducting the water. The trough is placed at a slight incline and the water, entering the first compartment, passes down through the trays of eggs, out at the bottom of the hatching-box, and up around its sides and ends on its way to the second compartment, all of the water passing through each box before it finally leaves the trough.

APPARATUS FOR SEMI-BUOYANT EGGS.

a. APPARATUS UTILIZING RIVER CURRENTS.

BRACKETT'S HATCHING-BOX.

A rectangular box of wood, the front end of which slopes inward at an angle of 45° for the purpose of deflecting the current. The bottom is covered with wire cloth and the water is forced through it by means of a tide-strip attached to its further edge. Length, 22 inches; width, 20 inches; depth, 12 inches. Patented by Edward A. Brackett, Winchester, Mass., February 8, 1876. 26,904. Presented by Edward A. Brackett.

GREEN'S HATCHING-BOX.

The original box in which Seth Green made his first experiments in hatching eggs of the shad. 26,903. Patented by Seth Green, Rochester, N. Y. Gift of Seth Green.

GREEN'S HATCHING-BOX.

A small model of the Green hatching-box. 26,997. Gift of Seth Green.

b. APPARATUS UTILIZING WAVE-ACTION.

WRIGHT'S SUBMERGED HATCHING-BOX.

A cubical box, with a hinge cover of wire cloth, the sides being of galvanized iron; the bottom, which is of the same material, being provided with circular openings an inch in diameter, each covered with valves opening upward to admit water from beneath. In the interior of the box, an inch above the valves, is a wire tray upon which the egg are allowed to rest, and through which the water can readily pass. The sides of the box are prolonged downward to form an expanding rim. The whole is suspended from a float and held in position by means of a small weight fastened to the bottom. The float is lifted upon the crest of the waves drawing the box through an equal distance, and as it descends into the hollow the valves open allowing the water to rush up through the opening and among the eggs, closing again to prevent suction as the box rises. Length, 10 inches; width, 10 inches; depth, 12 inches. Patented by Isaac H. Wright, of Baltimore, Md., August 20, 1878. Gift of Isaac H. Wright. 39,462. This box was invented for hatching eggs of the shad. It is claimed to be suitable for exposed streams where the current is slight but where the waves are of considerable size.

c. APPARATUS REQUIRING HEAD OR HYDRANT PRESSURE.

CHASE'S HATCHING-JAR.

A cylindrical jar of glass, with a metal rim notched at one side and provided with a wire screen for retaining the fish. The water is introduced through a glass tube at the bottom and passes upward through the eggs. Height, 16 inches; diameter, 6 inches. Invented by Oren M. Chase, Detroit, Mich. 39,142. This jar is extensively used for hatching eggs of the whitefish. When the embryos are developing, the outflow gate remains open, and through it any dead eggs which are carried upward by the current escapes, thus preventing the injurious effects which arises from fungus and dead eggs.

CLARK'S HATCHING-JAR.

Old style. A cylindrical jar of glass, with a metal rim notched at one side, and provided with a movable wire screen, which is open while the embryo are developing, to allow the escape of dead eggs, but closed when the hatching begins, to prevent the escape of the fish. The water is introduced through an open-

CLARK'S HATCHING-JAR—Continued.

ing at the bottom, passing upward through the eggs and out at the top. Height, 16 inches; diameter, 6 inches. Invented by Frank N. Clark, of Northville, Mich. 57,187. Presented by Frank N. Clark. Formerly extensively used for hatching eggs of the whitefish.

CLARK HATCHING-JAR. (Intermediate form.)

A cylindrical jar of glass, with a metal rim, having a spout on one side, through which the surplus water escapes. The water is introduced at the bottom through a tin tube with a funnel shaped opening, and passes upward through the eggs on its way to the outflow spout. Height, 16 inches; diameter, 6 inches. Designed by Frank N. Clark, Northville, Mich. 57,188. Presented by Frank N. Clark. Extensively employed for hatching eggs of the whitefish at the Fish Commission hatching station at Northville, Mich.

CLARK HATCHING-JAR. (New style.)

A cylindrical jar of glass, with a metal rim, having a spout at one side, from which the surplus water escapes. The bottom of the jar is provided with a metal cone corresponding with the funnel-shaped end of the supply tube, which is prevented from coming in contact with it by means of slight projections on its inner surface. Height, 18 inches; diameter, 6 inches. Designed by Frank N. Clark, Northville, Mich. 57,189. Presented by Frank N. Clark. This jar is coming into favor for hatching eggs of the whitefish, and is now used extensively at the Northville hatchery.

SHAD-HATCHING CONE.

With screen at the bottom. Devised by Charles F. Bell and Fred. Mather. 26,995. U. S. Fish Commission.

FERGUSON'S IMPROVED CONICAL HATCHER.

With removable top, used to prevent splashing; also arrangement for easily removing bottom screen. Valve used when bottom screen is to be removed or eggs and young fish to be transferred. Furnished also with hook for lifting vessel from frame. T. B. Ferguson. U. S. Fish Commission.

SECTION OF V-SHAPED HATCHING-TROUGH.

A simple trough, with false sides sloping downward from the top toward the center, leaving the space of one-eighth of an inch, covered with wire cloth, between their lower edges. The upper part of the trough is surrounded by perforated tin, through which the water passes into a sluiceway and thence to the

SECTION OF V-SHAPED HATCHING TROUGH—Continued.

escape pipes, which occur at short intervals. The water enters the apartment between the vertical and sloping sides with the hydrant pressure, and is forced up through the opening and out through the strainer at the top. The eggs, being heavy, tend to sink to the bottom, where they are caught by the current and carried upward and outward toward the sides; as the current weakens they gradually drop back toward the center, where they are again caught and carried through the same circuit. 57,178. Devised by Seymour Bower, Northville, Mich. U. S. Fish Commission.

McDONALD'S Y-SHAPED HATCHING-BOX.

A wooden box, with glass ends and sloping sides, for eggs. Length, 12 inches; width, 24 inches; depth, 15 inches. Invented by Marshall McDonald, for use in the U. S. Fish Commission work at Gunston, Va., in April, 1881. U. S. Fish Commission. 57,154. The sides of the box slope toward the bottom center until they come within an inch of each other. Below this opening is a space 3 or 4 inches deep for the introduction of water. This opening is nearly closed by means of an adjustable square wooden bar, one of the angles of which enters the center of the opening, the sides of the bar thus being parallel with those of the box. By this means the current is divided so that the water is deflected along either side of the box toward the surface, carrying the eggs with it and causing them to pass in toward the center and fall again to the bottom, where they are again caught by the current aud carried through the same circuit. The outlet is protected by a triangular trough running across the top center from side to side. This is placed a little below the top of the box, so that the water shall flow over its side and out through the openings. The current introduced is sufficiently strong to carry away the dead eggs into this trough, thus allowing them to escape, but is not strong enough to carry away the good eggs, which, being heavier than the dead ones, drop before reaching the trough. Great care must be taken to see that the flow of water is properly adjusted; otherwise many of the dead eggs may be retained or the good ones may be lost.

McDONALD'S UNIVERSAL HATCHING-JAR.

A glass jar, with metal cap, containing two circular openings. Through one of these, which is situated in the center, a glass tube for the introduction of water passes to within a short distance of the bottom of the jar. The other, situated near one side, contains a shorter glass tube, which serves as an outflow pipe. Height,

McDONALD'S UNIVERSAL HATCHING-JAR—Continued.

15 inches; diameter, 6 inches; capacity, 5 quarts. Patented by Marshall McDonald, Washington, D. C., in 1882. U. S. Fish Commission. 57,186. The McDonald jar is successfully employed in the hatching of various species of heavy eggs. The water in entering is thrown against the bottom with considerable force, and is deflected upward around the sides of the jar. The eggs, which tend to settle to the bottom, are carried upward along the sides, thence inward toward the center, from which point they again sink to the bottom. The current is regulated to give the desired motion to the eggs. With heavy eggs like those of the salmon there is no motion, but the water coming from beneath tends to buoy the eggs upward, thus preventing any injurious pressure on the lower ones by the mass above. The outflow pipe is movable, and can be lowered to a point where the dead eggs, which are lighter than the good ones, come in contact with it and are carried off. By this means the eggs are kept comparatively free from the injurious effects of fungous growth or decaying eggs. The jar can be filled two-thirds full of eggs with very satisfactory results. Sixty thousand shad eggs are considered a fair quantity.

McDONALD HATCHING JARS.

Photograph showing a nest of hatching-jars on the deck of steamer Lookout employed by the U. S. Fish Commission in shad-hatching in the Maryland and North Carolina waters. Size, 8 by 10 inches. Washington, D. C., 1882. 2,282. U. S. Fish Commission.

McDONALD HATCHING-JARS.

Photograph showing a nest of hatching-jars on the deck of steamer Lookout employed by the U. S. Fish Commission in shad-hatching in the Maryland and North Carolina waters. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. 2,282. U. S. Fish Commission.

d. MECHANICAL APPARATUS.

PARKER'S ROTATING HATCHER.

A windlass connected with a system of cog-wheels, which communicate motion to the hatching-cylinder by means of an endless chain. The cylinder is made of perforated tin and wire cloth, to admit of a free circulation of water. On the inside, suspended from the axis, is the small basket or trough which contains the eggs. Diameter of hatching-cylinder, 10 inches;

PARKER'S ROTATING HATCHER—Continued.

width, 4 inches. Invented by Joel C. Parker, Grand Rapids, Mich. 39,470. Presented by Joel C. Parker. The motion is communicated to the windlass, and thence through the clock-work to the hatching cylinder, by means of a weight which is suspended from the end of the windlass rope. The weight is raised by means of a crank attached to the windlass, and the distance through which it falls is considerably shortened by the use of compound pulleys.

FERGUSON'S SUBMERGED PLUNGING BUCKET.

A cylindrical brass frame, the top and sides of which are covered with nickel-plated wire cloth of fine mesh. The top is movable, being fastened by bolts and thumb-screws. Diameter, 14 inches; length, 20 inches. Invented by T. B. Ferguson, in 1880. 57,156. U. S. Fish Commission. This bucket is suspended from the end of a lever, which is worked by machinery. It is submerged to the depth of several feet, a vertical motion being imparted by the lever to facilitate the change of water. It has been used for hatching both heavy and floating eggs.

FERGUSON'S PLUNGING BUCKET.

A cylinder of block-tin, with a movable wire-cloth bottom; 24 inches long and 18½ inches in diameter. Invented by T. B. Ferguson, in 1877. U. S. Fish Commission. This bucket is suspended from the end of a lever so that the lower half or two-thirds is submerged. The motion of the lever is so adjusted as to give a quick drop and slow rise, the upward and downward movement being about 6 inches. A bucket as above described will hold 200,000 shad-eggs.

"HANGER," "CAM," AND "GUIDES."

For Ferguson's improvement in fish-hatching apparatus. In use on the U. S. steamer Fish Hawk for imparting a vertical motion to the hatching cans. Designed by T. B. Ferguson. 39,107. U. S. Fish Commission.

APPARATUS FOR ADHESIVE EGGS.

RICARDO'S SMELT-HATCHING BOX.

A rectangular box, with a hinge-cover and perforated ends, covered with wire cloth. The inside of the box is filled with twigs, to which the adhesive eggs of the smelt are attached. Devised by George Ricardo, Hackensack, N. J. 39,102. U. S. Fish Commission. This box is placed in the river where the current

RICARDO'S SMELT-HATCHING BOX—Continued.

is strong, the water entering and escaping through the circular opening at the end.

APPARATUS FOR FLOATING EGGS.

a. APPARATUS FOR UTILIZING WAVE ACTION.

WAVE HATCHING BOX.

A rectangular box, with a wire-cloth bottom and openings covered with the same material on the sides. Just below these, on the outside of the box, are wooden strips which serve as floats for holding the box in the proper position in the water. Length, 32 inches; width, 17 inches; depth, 16 inches; float, 3 inches wide. Invented by H. C. Chester, Noank, Conn., 1878. 57,161. U. S. Fish Commission. This box is employed in open streams for utilizing currents caused by the action of the waves. The box when placed in the water sinks to such a depth that the floats which extend around its exterior rest upon its surface. The upper portions of these floats make a slight angle with the surface, so that each wave as it comes in contact with the float runs up a slight incline, and after reaching the highest point passes down into the box, thus giving a constant circulation and the best possible motion to floating eggs.

b. APPARATUS REQUIRING RUNNING WATER.

CLARK'S ADHESIVE EGG APPARATUS.

c. MECHANICAL APPARATUS.

CHESTER'S SEMI-ROTATING HATCHER.

A cylindrical can, with five rectangular openings of wire cloth on the side and a bottom of the same material, to admit a circulation of water and to prevent the loss of eggs or the escape of fish after they have been hatched. Beneath the wire cloth bottom are four strips of tin radiating from the center and placed at such an angle that the rotation of the cylinder upon a vertical axis forces the water against them and up through the bottom. Invented by H. C. Chester, of Noank, Conn., in 1878. Presented by H. C. Chester. 57,160. Several of these are placed in a trough containing running water. Each bucket turns on a pivot, the power being applied from the engine by means of a horizontal arm fixed to its axis, and is kept constantly turning backward and forward through an arc of 30 degrees, thus creating a free circulation of water, which gives a motion to the eggs. Used chiefly for floating eggs like those of the cod.

HATCHING AND REARING ESTABLISHMENTS.

a. A LIST OF U. S. FISH COMMISSION HATCHING STATIONS.

The following is a list of the hatching stations operated by the U. S. Fish Commission in 1883:

1. Grand Lake Stream, Me. Station for collecting eggs of the Schoodic salmon (*Salmo salar* subsp. *sebago*).
2. Bucksport, Me. Station for collecting and hatching eggs of the Atlantic salmon (*Salmo salar*), and for hatching eggs of whitefish (*Coregonus clupeiformis*), to be distributed in the waters of the State.
3. Wood's Holl, Mass. Permanent coast station, which serves as a basis of operation for the scientific investigations of the Commission, and as a hatching station for eggs of the cod (*Gadus morrhua*) and other sea-fishes.
4. Cold Spring Harbor, Long Island, New York. Station for hatching eggs of various species of Salmonidæ for distribution in New York and vicinity.
5. Havre de Grace, Md. Station located on Battery Island, in the Susquehanna River, for the purpose of collecting and hatching eggs of the shad (*Clupea sapidissima*).
6. Washington, D. C.
   - *a*. National carp ponds. Ponds for the propagation of the three varieties of the carp (*Cyprinus carpio*), and the gold-fish (*Carassius auratus*), the golden ide (*Idus melanotus* var. *auratus*), and the tench (*Tinca vulgaris*).
   - *b*. Arsenal ponds. Ponds for the propagation of carp (*Cyprinus carpio*).
   - *c*. Navy-yard. Station for collecting and hatching eggs of the shad (*Clupea sapidissima*).
   - *d*. Central hatching station. A station fully equipped for scientific experiments connected with the propagation of fishes. The station is also provided with apparatus for hatching the eggs of all of the more important species, including light, heavy, and adhesive eggs. It is the principal distributing station of the Fish Commission for both eggs and young fish to all portions of the United States.
7. Wytheville, Va. A station for hatching eggs of brook-trout (*Salvelinus fontinalis*) and California trout (*Salmo irideus*).
8. Saint Jerome's Creek, Point Lookout, Md. A station for the artificial propagation of the oyster (*Ostrea virginica*), the Spanish mackerel (*Scomberomorus maculatus*), and the banded porgy (*Chætodipterus faber*).

9. Avoca, N. C. A station on Albemarle Sound, at the junction of Roanoke and Chowan Rivers, for collecting, hatching, and distributing eggs of the shad (*Clupea sapidissima*), alewife (*Clupea vernalis* and *æstivalis*), and striped bass (*Roccus saxatilis*).
10. Northville, Mich. A hatching station for the development and distribution of eggs of the whitefish (*Coregonus clupeiformis*). This station is also provided with tanks and ponds for the spawning, hatching, and rearing of brook-trout (*Salvelinus fontinalis*) and California trout (*Salmo irideus*).
11. Alpena, Mich. A station for the collection and development of the eggs of the whitefish (*Coregonus clupeiformis*).
12. Baird, Cal.
    a. Salmon station. A station on the McCloud River for the development and distribution of eggs of the California salmon (*Oncorhynchus chouicha*).
    b. Trout ponds. A station near Baird for collecting, developing, and distributing eggs of the California trout (*Salmo irideus*).
13. Clackamas River, Oregon. A station on Columbia River for collecting and hatching eggs of the California salmon (*Oncorhynchus chouicha*).

b. MODELS OF HATCHING HOUSES.

DRUID HILL HATCHERY.

Model of hatching house built at Druid Hill Park, Baltimore, Md., in 1875, under the direction of Maj. T. B. Ferguson, then State commissioner of fisheries. The interior of this model is fitted up with miniature hatching apparatus, showing the arrangements for actual work. It contains Ferguson hatching jars, flights of Coste trays, Williamson hatching troughs, Clark hatching troughs, Holton hatching box, Green hatching box, aquaria, and reservoir tank, provided with filters and porcelain-lined sinks.

BUCKSPORT HATCHERY.

Model of hatching house at United States salmon-breeding station at Bucksport, Me., built under the direction of Mr. Charles G. Atkins, with movable roof for showing the interior, which is provided with troughs for hatching eggs of the salmon. The water enters the troughs through a feed trough along the side of the room and escapes by pipes through the floor.

NORTHVILLE HATCHING-HOUSE.

Model; scale, 1 inch to the foot. This model, which represents one of the most important hatching houses of the U. S. Fish Commission, shows the interior arrangement of the hatchery, the

NORTHVILLE HATCHING-HOUSE—Continued.

various kinds of apparatus, consisting of Clark troughs, hatching jars, nursery tanks, and sorting and packing tables, being represented. Frank N. Clark, superintendent. 57,168. U. S. Fish Commission. This hatchery was established by N. W. Clark for the propagation of brook-trout, but for some years it has been used by the U. S. Fish Commission as a collecting and developing station for eggs of the whitefish (*Coregonus clupeiformis*), and during the past season (1882–'83) not less than 50,000,000 eggs have been handled here. These were shipped to various localities in the United States and Europe.

THE UNITED STATES FISH-HATCHERY, ALPENA, MICH.

This hatchery was built in the fall of 1882. It is a one-story frame building, 30 feet wide by 60 feet long, having front and rear entrances, and amply lighted by 14 windows. The main floor includes the hatching room, and an office and sleeping apartment, 10 feet wide by 18 feet long, the space between this office and the opposite side being conveniently utilized for storage of tools, cans, egg-cases, &c. The hatchery is arranged and equipped with especial reference to the manipulation of the embryos and minnows of whitefish (*Coregonus clupeiformis*), the most valuable commercial and food species of the Great Lakes. Its nominal capacity is 100,000,000 eggs. The water is furnished by the Holly Water Works Company, of Alpena, being forced through wooden mains from Thunder Bay, an arm of Lake Huron. A 2-inch stream, under an average pressure of 20 pounds to the square inch, connects with the hatchery, the discharge being regulated by globe valves and ball cocks The inlet pipe is laid underneath the building, near the front, and is tapped by four perpendicular arms, each discharging into the top tank of the four systems of tanks for operating the hatching vessels. Each system comprises a series of four rows of tanks, one row above the other. There are 2 tanks to each row, making 8 tanks to the series, or 32 in all, each of which is 15 feet long by 12 inches wide by 10 inches deep. One series is the exact counterpart of another. A row of faucets on either side of the top tank, into which the water first enters, supplies two rows of hatching jars or incubators, which rest on shelves placed across the second tank below and discharge into the tank between, which in turn feeds a second series of jars, and so on. In this way the four rows of a series operate three double rows of jars, the water being used three times over. Overflows are provided at the ends of the tanks which discharge into the next below. These series of tanks all connect with larger storage tanks for the minnows. Into these the current carries the minnows as

THE UNITED STATES FISH-HATCHERY, ALPENA, MICH.—Cont'd.

soon as hatched, and to prevent their escape the tanks are provided with overflows of finely perforated tin, in the shape of a box of sufficient dimensions to keep the minnows away from the strong current at the point of overflow. There are ten of these tanks provided for the reception of the minnows, the aggregate capacity being 7,000 gallons.

U. S. FISH COMMISSION STEAMER FISH HAWK.

A model of the U. S. Fish Commission steamer Fish Hawk, built by Pusey & Jones, of Wilmington, Del.

U. S. FISH COMMISSION STEAMER FISH HAWK.

Sectional model of the U. S. Fish Commission steamer Fish Hawk, on a scale of 2 inches to the foot, showing the hatching deck properly equipped with fish-hatching apparatus and the arrangement of hatching boxes on the outer side.

c. PHOTOGRAPHS OF HATCHING HOUSES AND PONDS.

Fixed hatcheries.

SCHOODIC HATCHERY.

Photographic view of the station of the U. S. Fish Commission for hatching eggs of the land-locked salmon. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (770) 2,228. U. S. Fish Commission.

SCHOODIC HATCHERY.

Photographic view of the hatching station of the U. S. Fish Commission, used for hatching eggs of the land-locked salmon. (Looking northwest.) Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (773) 2,231. U. S. Fish Commission.

SCHOODIC HATCHING STATION.

Photographic view of the principal buildings at the station of the U. S. Fish Commission, where eggs of the land-locked salmon are taken and hatched. (Looking southwest.) Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (774) 2,232. U. S. Fish Commission.

SCHOODIC HATCHING STATION.

A general photographic view of the fish inclosures, spawning-house, and watch-house at the U. S. Fish Commission hatchery. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Grand Lake Stream, Me., 1882. (771) 2,229. U. S. Fish Commission.

SCHOODIC HATCHING STATION.

A general photographic view of the fish inclosures, spawning-house, and watch house at the U. S. Fish Commission hatchery. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (771) 2,229. U. S. Fish Commission.

SCHOODIC HATCHERY.

A photographic view of the lower floor of the U. S. Fish Commission hatchery, showing the apparatus employed in hatching eggs of the land-locked salmon. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (775) 2,233. U. S. Fish Commission.

SCHOODIC HATCHERY.

A photographic view of the interior second story of the U. S. Fish Commission hatchery for salmon at Grand Lake Stream. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (760) 2,220. U. S. Fish Commission.

SCHOODIC HATCHERY.

A photographic view of the lower floor of the U. S. Fish Commission hatchery, showing the apparatus employed in hatching eggs of the land-locked salmon. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Grand Lake Stream, Me., 1882. (775) 2,233. U. S. Fish Commission.

FISH INCLOSURE.

Photograph of the lower barrier of the inclosure built at Bucksport for retaining the unripe salmon until the eggs have matured. Size, 8 by 10 inches. Bucksport, Me., 1882. (755) 2,216. U. S. Fish Commission.

FISH INCLOSURE.

Photograph of the lower barrier of the inclosure built at Bucksport for retaining the unripe salmon until the eggs have matured. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Bucksport, Me., 1882. (755) 2,216. U. S. Fish Commission.

SALMON HATCHERY.

Photographic view of the hatching house used by the U. S. Fish Commission in the propagation of the California salmon on the McCloud River. Size, 8 by 10 inches. Baird, Cal., 1882. (687) 2,163. U. S. Fish Commission.

HATCHING STATION.

Photograph showing the mess-house for use of the employés at the U. S. salmon hatchery on the McCloud River, as seen from Rattlesnake Bar. Size, 8 by 10 inches. Baird, Cal., 1882. (696) 2,170. U. S. Fish Commission.

SALMON STREAM.

Photographic view of the McCloud River, Cal., as seen from Colchoolooloo's Rancheria (near United States salmon-hatching station), looking down stream. Size, 8 by 10 inches. Baird, Cal., 1882. (684) 2,160. U. S. Fish Commission.

TROUT PONDS.

Photographic view of the buildings and ponds used by the U. S. Fish Commission in the artificial propagation of California trout. Size, 8 by 10 inches. Near Baird, Cal., 1882. (700) 2,172. U. S. Fish Commission.

SALMON HATCHERY.

Photograph of the hatching-house used by the U. S. Fish Commission in the propagation of the California salmon on the McCloud River. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Baird, Cal., 1882. (687) 2,163. U. S. Fish Commission.

SALMON STREAM.

Photographic view of McCloud River, Cal., as seen from Colchoolooloo's Rancheria, near United States hatching station, looking down stream. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Baird, Cal., 1882. (684) 2,160. U. S. Fish Commission.

SALMON SPAWNING-GROUNDS.

Photograph showing an enormous school of salmon ascending the river on their way to their spawning-grounds. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 inch negative. Pacific coast, 1882. U. S. Fish Commission.

SALMON SPAWNING-GROUNDS.

Photographic view of McCloud River from "Lone Rock," near U. S. salmon hatchery. Size, 8 by 10 inches. Baird, Cal., 1882. (705) 2,175. U. S. Fish Commission.

HAVRE DE GRACE HATCHING STATION.

Photograph of buildings employed by the U. S. Fish Commission for hatching eggs of the shad, and the breakwater which has been built to prevent the floating hatcheries and steamers from being damaged while lying at the hatchery. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (667) 2,152. U. S. Fish Commission.

HAVRE DE GRACE HATCHING STATION.

Near photographic view of the buildings used by the U. S. Fish Commission for hatching shad. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (674) 2,151. U. S. Fish Commission.

HAVRE DE GRACE HATCHING STATION.

Distant photographic view of the buildings used by the U. S. Fish Commission for hatching shad. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (665) 2,150. U. S. Fish Commission.

HATCHING STATION.

Photograph showing the boats employed at the U. S. Fish Commission shad station, with a view of the locality where the fish are taken in the background. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (670) 2,154. U. S. Fish Commission.

SHAD INCLOSURE.

Photograph of the harbor or pond at the hatching station of the U. S. Fish Commission for penning unripe shad until their eggs are sufficiently developed to enable them to be utilized for hatching purposes. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (669) 2,153. U. S. Fish Commission.

SHAD INCLOSURE.

Photograph showing the harbor or pond at the hatching station of the U. S. Fish Commission for penning unripe shad until their eggs are sufficiently developed to enable them to be utilized for hatching purposes. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Havre de Grace, Md., 1882. (669) 2,153. U. S. Fish Commission.

CENTRAL HATCHING STATION.

Photograph of the interior of the U. S. Fish Commission hatchery, showing the room fitted with McDonald jars for hatching eggs of the shad. Size, 8 by 10 inches. Washington, D. C., 1882. 2,240. U. S. Fish Commission.

CENTRAL HATCHING STATION.

Photograph of the interior of the U. S. Fish Commission hatchery, showing the room fitted with McDonald jars for hatching eggs of the shad. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. 2,240. U. S. Fish Commission.

CARP PONDS.

General photographic view of the U. S. Fish Commission carp ponds. Taken from an elevation near the Washington Monument. Size, 8 by 10 inches. Washington, D. C., 1882. (620) 2,127. U. S. Fish Commission.

CARP PONDS.

General photographic view of U. S. Fish Commission carp ponds. Similar to (620) 2,127, but from a different point. Size, 8 by 10 inches. Washington, D. C., 1882. (621) 2,128. U. S. Fish Commission.

CARP PONDS.

Photograph showing several of the smaller ponds and principal buildings at the U. S. Fish Commission carp ponds, as seen from an elevation. Size, 8 by 10 inches. Washington, D. C., 1882. (628) 2,131. U. S. Fish Commission.

CARP PONDS.

General photographic view of the U. S. Fish Commission carp ponds, looking north with a wide-angle lens. Size, 8 by 10 inches. Washington, D. C., 1882. (619) 2,126. U. S. Fish Commission.

CARP PONDS.

General photographic view of the U. S. Fish Commission carp ponds. Taken from an elevation near the Washington Monument. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. (620) 2,127. U. S. Fish Commission.

NORTHVILLE HATCHING STATION.

A photographic view of the right side of the Northville hatchery, used by the U. S. Fish Commission for hatching eggs of the whitefish, and, to a limited extent, for salmon eggs sent from California, and for eggs of grayling and trout taken from fish kept in the ponds at the hatchery. Size, 8 by 10 inches. Northville, Mich., 1882. (730) 2,194. U. S. Fish Commission.

NORTHVILLE HATCHING STATION.

A photographic view of the left side of the Northville hatchery, used by the U. S. Fish Commission for hatching eggs of the whitefish, and, to a limited extent, for salmon eggs sent from California, and for eggs of grayling and trout taken from fish kept in the ponds at the hatchery. Size, 8 by 10 inches. Northville, Mich., 1882. (731) 2,195. U. S. Fish Commission.

NORTHVILLE HATCHERY.

Photograph of the interior of the U. S. Fish Commission hatchery at Northville, showing the apparatus employed in hatching the whitefish and other species. Size, 8 by 10 inches. Northville, Mich., 1882. (736) 2,200. U. S. Fish Commission.

NORTHVILLE HATCHING STATION.

A photographic view of the right side of the Northville hatchery, used by the U. S. Fish Commission for hatching eggs of the whitefish, and, to a limited extent, for salmon eggs sent from California, and for eggs of grayling and trout taken from fish kept in the ponds at the hatchery. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Northville, Mich., 1882. (730) 2,194. U. S. Fish Commission.

NORTHVILLE HATCHING STATION.

Photographic view of the left side of the Northville hatchery, used by the U. S. Fish Commission for hatching eggs of the whitefish, and, to a limited extent, for salmon eggs sent from California, and for eggs of grayling and trout taken from fish kept in the ponds at the hatchery. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Northville, Mich., 1882. (731) 2,195. U. S. Fish Commission.

NORTHVILLE HATCHERY.

Photograph of the interior of the U. S. Fish Commission hatchery at Northville, showing the apparatus employed in hatching the whitefish and other species. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Northville, Mich., 1882. (736) 2,200. U. S. Fish Commission.

ALPENA HATCHERY.

Photograph of the interior of the U. S. Fish Commission whitefish hatchery, showing the apparatus employed in hatching eggs of that species. Size, 8 by 10 inches. Alpena, Mich., 1882. (781) 2,236. U. S. Fish Commission.

SANDUSKY HATCHERY.

Photograph of the interior of the whitefish hatchery belonging to the Ohio Fish Commission, showing the apparatus employed in hatching eggs of the whitefish. Size, 8 by 10 inches. Sandusky, Ohio, 1882. (735) 2,199. U. S. Fish Commission.

SANDUSKY HATCHERY.

Photograph of the interior of the whitefish hatchery belonging to the Ohio Fish Commission, showing the apparatus employed in hatching eggs of the whitefish. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Sandusky, Ohio, 1882. (735) 2,199. U. S. Fish Commission.

Movable hatcheries.

FLOATING HATCHERY.

Photograph of the hatching barge and steamer Fish Hawk belonging to the U. S. Fish Commission, and employed in hatching shad and other species of food-fishes. Size, 8 by 10 inches. Havre de Grace, Md., 1882. (664) 2,149. U. S. Fish Commission.

HATCHING BARGE.

Photograph of the interior of U. S. Fish Commission hatching barge employed in the shad-work in Maryland, Virginia, and North Carolina. The barge is a floating hatchery, being pre-

HATCHING BARGE—Continued.

ferred to a stationary one, as it can be towed to different localities during the height of the spawning season, thus obviating the necessity of having several outfits of hatching apparatus, the one sufficing for the entire work. The barge is fitted with Bell and Mather cones, formerly extensively used in hatching shad eggs. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,249. U. S. Fish Commission.

HATCHING BARGE.

Photograph of the interior of U.S. Fish Commission hatching barge, employed in the shad-work in Maryland, Virginia, and North Carolina. The barge is a floating hatchery, being preferred to a stationary one, as it can be towed to different localities during the height of the spawning season, thus obviating the necessity of having several outfits of hatching apparatus, the one sufficing for the entire work. The barge is fitted with Bell and Mather cones, formerly extensively used in hatching shad eggs. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Avoca, N. C., 1877. 2,249. U. S. Fish Commission.

HATCHING STEAMER FISH HAWK.

Photograph of the steamer Fish Hawk, employed by the U. S. Fish Commission for scientific investigations and for hatching purposes. The steamer is fitted with hatching apparatus employed in hatching eggs of the shad, in the waters of Maryland and North Carolina, during a portion of the year. Size, 8 by 10 inches. Washington, D. C., 1882. 2,255. U. S. Fish Commission.

HATCHING STEAMER FISH HAWK.

Photograph of the steamer Fish Hawk, employed by the U. S. Fish Commission for scientific investigation and for hatching purposes. The steamer is fitted with hatching apparatus, employed in hatching eggs of the shad, in the waters of Maryland and North Carolina during a portion of the year. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C. 2,255. U. S. Fish Commission.

d. FISH-REARING ESTABLISHMENTS.

STONE & HOOPER'S TROUT NURSERY.

A trough, or sluice-way, covered with lattice-work to admit the light. The upper end, through which the water enters, is cov. ered with wire cloth to prevent the escape of the fish, and the outflow-spout at the lower end is similarly protected. Designed by Stone & Hooper. 29,380. Collected by Livingston Stone.

e. MAPS SHOWING TOPOGRAPHY OF GROUNDS ADJACENT TO FISH-CULTURAL ESTABLISHMENTS.

SCHOODIC SALMON-BREEDING STATION.

Plan No. 2, showing hatching-park, fishing-grounds, and principal buildings. Scale, 1 inch = 60 feet.

SCHOODIC SALMON BREEDING STATION.

Plan 4, embracing plan of hatchery No. 3. Scale, 1 inch = 2 feet.

PENOBSCOT SALMON-BREEDING STATION.

Hatchery and watchman's room, plan and elevation. Scale, 1 inch = 2 feet.

PENOBSCOT SALMON-BREEDING STATION.

Plan of inclosure for parent salmon. Scale, 1 inch = 50 feet.

CARP PONDS AT WASHINGTON, D. C.

Plan of west and north pond; gives elevation, bench-marks, and areas. Surveyed by C. Junken, September, 1882. Scale, 1 inch = 30 feet.

GREAT FALLS, MARYLAND SIDE, POTOMAC RIVER.

Survey by Eugene Ellicott, November 25, 1882, to January 10, 1883, for U. S. Fish Commission. Scale, 1 inch = 50 feet.

SAINT JEROME CREEK.

West shore of Chesapeake Bay, Point Lookout to Point No Point; surveyed between 1848 and 1856; copied from U. S. Coast and Geodetic Survey Office for U. S. Fish Commission January 4, 1882. Scale, $\frac{1}{20000}$.

MCCLOUD RIVER TROUT POUNDS.

General plan of ponds, buildings, &c., with dimensions. Scale, 1 inch = 30 feet.

ACCESSORIES TO HATCHING APPARATUS.

AINSWORTH'S SPAWNING-RACE.

Model of natural spawning-race, invented by Stephen H. Ainsworth, West Bloomfield, N. Y. Not patented. This device consists of two sets of frames, covered with wire cloth, placed in two layers; the upper one has meshes coarse enough to allow the eggs to pass through, and is covered with coarse gravel, in which the fish make nests and spawn. The upper screens are then lifted and the ova taken from the lower ones. 42,936. Gift of S. H. Ainsworth.

COLLINS'S SPAWNING-RACE.

Model of spawning-race similar to the Ainsworth spawning-race, but with an endless revolving wire cloth apron in place of the lower trays, and a movable pan, which receives the eggs. The advantages of this spawning-race are saving of time and labor, and convenience of manipulation, as the men are not obliged to go into the water in order to secure the eggs. Patented by A. S. Collins, U. S. Fish Commission.

MARBLEIZED SPAWNING-PANS.

Pans of marbleized iron of various sizes. U. S. Fish Commission. 57,155. Used for receiving and impregnating eggs of different species. These pans can be advantageously used in salt water, as they are not liable to rust.

COMMON SPAWNING PANS.

Ordinary tin pans with flaring sides, used in the manipulation of eggs of fresh-water fishes. 12 inches in diameter and 3 inches deep. U. S. Fish Commission. 39,116.

EGG-DIPPER.

A seamless tin dipper. Diameter of bowl, 5 inches; depth of bowl, 2½ inches; length of handle, 10 inches. U. S. Fish Commission. 42,938. Used in changing water on eggs while *en route* for the hatchery.

WOODEN NIPPERS FOR REMOVING DEAD EGGS.

Devised by F. Mather. 26,915. U. S. Fish Commission.

WOODEN NIPPERS, WITH WIRE LOOPS, FOR REMOVING DEAD EGGS.

Devised by M. A. Green. 39,113. New York Fish Commission.

SHAD SKIMMING-NET.

A rectangular frame of galvanized iron, covered with coarse-mesh netting, and provided with a wooden handle, for removing dead shad eggs from hatching-boxes and cones. Net, 6 inches long and 5 inches wide; handle, 6 inches long. Devised by M. A. Green, Rochester, N. Y. 39,114 (*a*). Presented by the New York Fish Commission.

TROUGH-NET.

A semicircular galvanized iron frame covered with fine-meshed netting, and provided with a wooden handle, for removing young salmon and other smaller fish from the hatching and feeding troughs. Presented by T. B. Ferguson, Baltimore, Md. 39,115. U. S. Fish Commission.

TROUGH-NET.

A semicircular galvanized-iron frame covered with cloth, and provided with a wooden handle, for removing young salmon and other smaller fish from the hatching and feeding troughs. Presented by T. B. Ferguson, Baltimore, Md. U. S. Fish Commission.

CLEANING-NET.

A piece of fine-mesh netting stretched upon a rectangular wire frame and provided with a wooden handle. Frame, 5½ inches long and 4½ inches wide; handle, 13 inches long. In general use. 39,114. U. S. Fish Commission.

REFLECTOR LANTERN.

A patent tubular lantern, provided with a movable reflector of tin. Frame of lantern, 15 inches high; diameter of reflector, 16 inches. 39,118. U. S. Fish Commission. This lantern is extensively used by the United States Fish Commission when collecting and impregnating eggs of the shad and other species at the fishing shores, and from the boats of the gill-netters at night. It is occasionally employed at the hatchery when manipulating the eggs. The reflector is movable and can be taken off when not needed. It is provided with grooves at the sides, to correspond with the lantern tubes, which hold it in position.

WATER-WHEEL.

Photograph of the wheel which supplies the U. S. salmon-breeding station on the McCloud River with water. Also, of the dam which furnishes the current for turning the wheel. Size, 8 by 10 inches. Baird, Cal., 1882. (680) 2,157. U. S. Fish Commission.

WATER-WHEEL.

Photograph of the wheel which supplies the U. S. salmon-breeding station on the McCloud River with water. Also, of the dam which furnishes the current for turning the wheel. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Baird, Cal., 1882. (680) 2,157. U. S. Fish Commission.

EGG REFRIGERATOR.

Drawing of a prospective refrigerator building, to be constructed at the Northville hatchery of the U. S. Fish Commission, for storing eggs of the whitefish to retard their development for several months, or until such time as room can be made for them in the hatching house. Size, 30 by 40 inches. Washington, D. C., 1882. Henry W. Elliott.

8. Transportation apparatus and accessories.

a. apparatus for transporting fry.

Fish Commission transportation can.

A cylindrical can of block-tin, the top of which is contracted and provided with a cover to prevent splashing of water while in transit. Height, 24 inches; diameter, 14 inches; capacity, 12 gallons. U. S. Fish Commission. 26,911. This can is more extensively used than any other kind for the transportation of young shad, and proves very satisfactory. The contraction of the neck, giving only a limited free surface, prevents any violent agitation of the water.

Clark's fish-transportation can.

A cylindrical tin can with 20 circular trays of perforated tin. Diameter, 6 inches; height, 9 inches. Designed by Frank N. Clark, Northville, Mich. 57,165. U. S. Fish Commission. The trays rest one upon the other, a tube, which extends from the top to the bottom of the can, passing through the center of each. The water is introduced through this tube, passes to the bottom and up through the eggs on its way to the outlet near the top of the can. Each tray will accommodate one thousand salmon.

Ferguson's transportation can.

A cylinder of block-tin, with movable top fitted with a rubber rim and thumb-screws for rendering it water-tight. 24 inches high and 14 inches in diameter. Capacity, 12 gallons. This can is provided with nipple attachments by means of which several can be connected so that a current of water will flow from one to another, thus giving a circulation during transit. This can carries from 15,000 to 30,000 shad.

Stone's conical transportation box.

Model. A truncated cone of tin with perforated cover, capable of holding ice for reducing temperature of water in can. Height, 12 inches; diameter, 11 inches at base and 6 inches at top. Designed by Livingston Stone. 29,379. Presented by Livingston Stone. This can is used in the transportation of various species of salmonidæ. Its principal advantages are derived from its peculiar shape, which, according to the inventor, facilitates the aeration of water. Cans of similar shape with the cone produced into a long funnel-shaped cover are frequently used.

Rogers's transportation can.

A cylindrical tin can provided with a false bottom one inch above the other. In the center of the upper bottom is a circular open-

ROGERS'S TRANSPORTATION CAN—Continued.

ing covered with wire cloth to admit of circulation of the water. On either side of the can is a tube of tin extending through the upper bottom. One of these has a funnel-shaped top and serves as a feed-tube for introducing fresh water; the other is provided with a pump by means of which stale water can be removed. Diameter, 9½ inches; height, 10 inches. Invented by Charles W. Rogers, Waukegan, Ill. 26,281. Presented by Charles W. Rogers.

AUTOMATIC TRANSPORTATION CAN.

A cylindrical can of copper, with contracting neck to prevent splashing, and a movable cover, the center of which contains a brass plate with tubular openings, through which the water enters and escapes. Height, 18 inches; diameter, 14 inches. U. S. Fish Commission. 57,175. To the inner end of the outflow-pipe is attached a wire frame, covered with cloth, which serves as a strainer to prevent the escape of the fish. The outer end of the other tube communicates with a reservoir of water by means of rubber tubing. When several cans are fed by the same reservoir they are placed side by side and so connected that the water passes readily from one to the other.

AUTOMATIC TRANSPORTATION CAN.

A cylinder of tin, strengthened by a heavy brass frame. The can is provided with a movable cover, the center of which contains a brass plate with tubular openings, through which the water enters and escapes. Height, 13 inches; diameter, 14 inches. U. S. Fish Commission. 57,174. To the inner end of the outflow-pipe is attached a wire frame, covered with cloth, which serves as a strainer to prevent the escape of the fish. The outer end of the other tube communicates with a reservoir of water by means of rubber tubing. When several cans are fed by the same reservoir they are placed side by side and so connected that the water passes readily from one to the other. Cans of this size hold about 20,000 shad.

CARP TRANSPORTATION CAN.

A cylindrical tin can, incased in wood, with the top slightly contracted to prevent splashing. Diameter, 12 inches; height, 18 inches; capacity, 10 gallons. U. S. Fish Commission. 57,172. This can holds from 30 to 50 carp 3 inches in length. It was formerly extensively used in the transportation of this species, but it is now seldom employed, as small pails are found more convenient, less expensive, and equally satisfactory.

CARP TRANSPORTATION CAN.

A cylindrical tin can, incased in wood, with the top slightly contracted to prevent splashing. Diameter, 10 inches; height, 13½ inches; capacity, 6 gallons. U. S. Fish Commission. 57,171. This can holds 10 three-inch carp. It was formerly extensively used in the transportation of this species, but it is now seldom employed, as small pails are found more convenient, less expensive, and equally satisfactory.

CARP TRANSPORTATION CRATE.

A wooden crate, provided with 16 two-quart tin pails, arranged in two tiers, separated by a wooden partition. Length, 32 inches; width, 18 inches; depth, 14 inches. Designed by Marshall McDonald in February, 1881. U. S. Fish Commission. 57,173. This crate has now almost wholly superseded the more cumbersome and expensive cans. In shipping, cans intended for different persons in the same section are placed together in the same crate, each being provided with a tag bearing the name of the consignee. On its arrival at the proper railroad center the crate is opened by the employés of the express company and the cans reshipped to the parties for whom they are intended.

b. PHOTOGRAPHS ILLUSTRATIVE OF THE METHOD OF TRANSPORTING FRY.

SHIPPING FISH.

Photograph showing a number of transportation cans, containing young shad, at central hatchery of U. S. Fish Commission. Two men are engaged in removing stale water by means of a siphon and supplying fresh water, while others are employed in loading the fish into a wagon for delivery to the railway authorities. Size, 8 by 10 inches. Washington, D. C., 1882 2,241. U. S. Fish Commission.

SHIPPING SHAD.

Photograph of the employés of the U. S. Fish Commission at work loading cans of young shad on a steam-launch which carries them to the river landings for shipment. The launches are also employed in distributing the men at the different fisheries and bringing them with their take of eggs to the hatchery after their seines have been hauled. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,246. U. S. Fish Commission.

PLANTING SHAD.

Photograph of the employés of the U. S. Fish Commission turning young shad that have been artificially hatched into the waters of Albemarle Sound. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,247. U. S. Fish Commission.

SHIPPING CARP.

A photograph of the U. S. Fish Commission car, employed in distributing young fish to all portions of the United States, showing men engaged in loading it with carp at the central hatching station. Size, 8 by 10 inches. Washington, D. C., 1882. 2,242. U. S. Fish Commission.

FISH TRANSPORTATION CANS.

Photograph showing a wagon-load of empty cans on their way to the United States carp ponds, to be filled with young carp for shipment to the rivers of the interior. Size, 8 by 10 inches. Washington, D. C., 1882. (618) 2,125. U. S. Fish Commission.

CLEANING TRANSPORTATION CANS.

Photograph of the employés of the U. S. Fish Commission at the Avoca shad station, cleaning cans before filling them with young shad, which are to be sent by rail to the interior of the country. Fish cans are carefully cleaned after each trip to remove all slime, dirt, and rust that may have collected. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,245. U. S. Fish Commission.

STEAM LAUNCH.

Photograph of a small launch employed by the U. S. Fish Commission, at its Avoca hatchery, for collecting eggs and carrying young fish. Size, 8 by 10 inches. Avoca, N. C., 1877. 2,248. U. S. Fish Commission.

SHIPPING FISH.

Photograph showing a number of transportation cans containing young shad, at central hatchery of the U. S. Fish Commission. Two men are engaged in removing stale water by means of a siphon, and supplying fresh water, while others are employed in loading the fish into a wagon for delivery to the railway authorities. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. 2,241. U. S. Fish Commission.

SHIPPING CARP.

Photographic view of the U. S. Fish Commission car, employed in distributing young fish to all portions of the United States. Showing men engaged in loading it with carp at the central hatching station. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. 2,242. U. S. Fish Commission.

FISH TRANSPORTATION CANS.

Photograph showing a wagon load of empty cans on their way to the United States carp ponds, to be filled with young carp for

FISH TRANSPORTATION CANS—Continued.

shipment to the rivers of the interior. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. (618) 2125. U. S. Fish Commission.

c. APPARATUS FOR TRANSPORTING SPAWNING FISH.

TOURING CAR.

Model. A car employed at the Gloucester hatching station of the U. S. Fish Commission for transporting spawning codfish alive from the fishing-grounds to the hatchery. Length, 9 inches; breadth, 3 inches; depth, $\frac{3}{4}$ inch. 22,221. U. S. Fish Commission.

SALMON DORY-CAR.

Model. A fishing-dory, the central portion of which is partitioned off and covered with netting for retaining the fish while in transit to the breeding-pens. Just in front of the partition, which is made of slats, are two large circular openings provided with wooden slides for admitting fresh water. In the rear of the compartment are other openings similarly arranged. Designed by Charles G. Atkins, of Bucksport, Me. 57,162. U. S. Fish Commission. This live-car is employed at the Penobscot breeding-station for conducting the salmon from the weirs to the hatchery, a distance of several miles, and is frequently used as a pen for the salmon for several days or weeks.

SALMON CAR.

Model, scale 4 inches to the foot ($\frac{1}{3}$). A water-tight box provided with a sliding-cover and handles for carrying fish overland from the fishing shores to the hatchery. Designed by C. G. Atkins, Bucksport, Me. 26,932. Presented by C. G. Atkins. This box is filled with water and the salmon placed in it, after which it is carted a distance of several miles, the salmon usually arriving in good condition.

FISH CARS.

Photograph showing a group of dories made into live-cars for transporting spawning salmon and for retaining them for a few days during the hatching season until the eggs are in condition to be taken. Size, 8 by 10 inches. Bucksport, Me., 1882. (757) 2,218. U. S. Fish Commission.

SALMON CAR.

Photograph of a towing-car used by the employés of the Bucksport hatching station for transporting unripe salmon from the fishing weirs in the Penobscot River to the inclosures at the

SALMON CAR—Continued.

hatchery, where they are to be retained until the eggs are sufficiently developed for hatching purposes. Size, 8 by 10 inches. Bucksport, Me., 1882. (754) 2,215. U. S. Fish Commission.

FISH CARS.

Photographic view of a group of dories made into live-cars for transporting salmon and for retaining them for a few days during the hatching season until the eggs are in condition to be taken. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Bucksport, Me., 1882. (757) 2,218. U. S. Fish Commission.

SALMON CAR.

Photographic view of a towing-car used by the employés of the Bucksport hatching station for transporting unripe salmon from the fishing weirs in the Penobscot River to the inclosures at the hatchery, where they are to be retained until the eggs are sufficiently developed for hatching purposes. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Bucksport, Me., 1882. (754) 2,215. U. S. Fish Commission.

d. APPARATUS FOR CARRYING EGGS.

TRANSPORTATION BUCKET.

A tin bucket with flaring sides, into which impregnated eggs are introduced, for convenience in carrying. Diameter at top, 11 inches; at bottom, 6 inches; depth, 9 inches; capacity, 2 gallons. U. S. Fish Commission. 1,785.

WROTEN BUCKET.

A tin bucket having spouts which communicate with a closed chamber extending entirely around the bottom. Invented by William H. Wroten, June, 1877. U. S. Fish Commission. 39,119. Diameter at top, 15 inches; at bottom, 11¼ inches; height, 11 inches. The water is introduced through the spouts at the sides, passing to the bottom and into the interior of the bucket; thence upward through the eggs and out through the perforated tin which surrounds the top. This bucket was invented for convenience in changing the water and handling the eggs while carrying them from the fishing-shore to the hatchery. Eggs have occasionally been allowed to remain in it until hatched, though it is more successful as a transportation bucket than a hatching can.

HAMLIN'S EGG-TRANSPORTATION CAN.

Height, 19½ inches; diameter, 13 inches. Devised by William H. Hamlin. Baltimore, Md., 1879. 57,151. U. S. Fish Com-

HAMLIN'S EGG-TRANSPORTATION CAN—Continued.

mission. This apparatus consists of a cylindrical tin can, the bottom part of which has sloping sides, the top being provided with a wire-cloth strainer and tin spout, to enable the water to be more easily poured. It has handles for convenience in carrying. Designed for use in boats when carrying shad-eggs across rough water, the sides being high to prevent slopping.

TAYLOR'S EGG-TRANSPORTATION CAN.

Height, 19½ inches; diameter, 13 inches. Invented by Thomas Taylor. Newberne, N. C., 1878. 57,153. U. S. Fish Commission. The can is provided with pans or trays for holding the eggs. In the center of the can, extending from top to bottom, is a supply tube, an inch in diameter, with holes opposite each tray. This tube extends upward between the tray and cover, water being introduced at the top by means of a funnel passing out through the jets upon the eggs, and dripping through the different trays to the bottom of the can, where it escapes through numerous small openings around the sides. This apparatus has been successfully used in the transportation of shad-eggs from distant fishing-shores to the hatchery. It marks the transition period between the old, or wet, and the new, or dry, method of transportation; for by it water was thrown upon the eggs at frequent intervals, though they were not at any time immersed in it.

MCDONALD'S EGG-TRANSPORTATION CRATE.

A crate containing eighteen shallow trays or wooden frames, with wire-cloth bottoms, incased in canvas, and secured by frames connected by leather straps. Length, 16 inches; height, 15 inches; width, 14 inches. Invented by Marshall McDonald, May, 1881. U. S. Fish Commission. 57,150. This crate is used for transporting the eggs of the shad for a distance of 50 to 100 miles. The bottoms of the trays are covered with wet cloths, upon which the eggs are spread. Each tray holds from 10,000 to 15,000 shad eggs. When filled, they are incased in the cloth cover, securely strapped together, and shipped by boat or rail to the hatchery. This apparatus marks the beginning of the dry transportation of shad eggs, and has been successfully used in the work of the U. S. Fish Commission for the past two years.

CLARK'S WHITEFISH CRATE.

Model, scale 3 inches to the foot. A box containing a crate of ten trays, surrounded by sawdust to prevent sudden change of temperature. Designed by Frank N. Clark, Northville, Mich. U. S.

CLARK'S WHITEFISH CRATE—Continued.

Fish Commission. 57,167. This crate is used only for short distances, and chiefly for sending eggs from the fishing shores to the hatchery, a distance of 20 to 50 miles. The trays are provided with canton-flannel bottoms, upon which the eggs are placed; these in turn are covered with a layer of cloth, the remaining space in the tray being filled with wet moss.

McDONALD'S EGG-REEL.

A simple contrivance by means of which adhesive eggs are attached to cotton cord, to facilitate hatching and transporting. Frame: height, 23 inches; width, 14 inches; length of reel, 12 inches; breadth of reel, 10 inches; diameter of funnel, 6 inches. Invented by Marshall McDonald. 1882. 57,152. U. S. Fish Commission. To be used in transporting eggs of the alewife and perch. The square box at the bottom contains a ball of twine, the end of which passes up through the opening in the funnel and is fastened to the reel. The eggs are placed with water in the funnel, and, as the cord is drawn through them by means of the crank and reel, quantities of them adhere to it and are reeled upon the frame. When a frame has been filled it is transported, in a crate holding twelve of them, to the hatchery, where the strings with the eggs are removed and suspended in the proper hatching apparatus. If desirable, the entire frame with its contents can be placed in the hatching apparatus.

CLARK'S EGG-TRANSPORTATION CASE.

Model, scale 4 inches to the foot. A wooden case containing twenty trays, each consisting of a piece of canton-flannel stretched across a wooden frame. Patented by Nelson W. Clark, of Charleston, Mich., March 31, 1874. 57,166. This case is used chiefly for transportation of eggs of the whitefish (*Coregonus clupeiformis*), though it is often successfully used for salmonoids and other fishes.

ATKINS'S TRANSPORTATION BOX.

Scale, 6 inches to the foot. A wooden box containing four smaller boxes, in each of which 15,000 salmon eggs are placed upon layers of muslin. Devised by Charles G. Atkins, Bucksport, Me. The space between the larger and smaller boxes is filled with hay to prevent an unhealthy change of temperature, and the layers of eggs are separated from each other by wet moss. Eggs packed in this way can be sent several thousand miles with very satisfactory results.

MODEL OF ANNIN'S EGG-TRANSPORTATION BOX.

This apparatus consists of an outer case which contains a smaller one, surrounded by sawdust to prevent loss of eggs from sudden change of temperature. The inner case is provided with eight trays, with canton-flannel bottoms, for holding the eggs. The tops and bottoms of both the inner and outer boxes have small openings by means of which the eggs can be kept moist, the water being thrown upon the top of the box and allowed to trickle through the eggs on its way to the bottom. There is a small ice-chamber between the tops of the outer and inner boxes, and the bottom of the outer box is provided with wooden strips to prevent its coming in contact with the surface on which it rests, which would prevent drainage. Devised by James Annin, jr. Caledonia, N. Y. 39,121. Boxes of this patent have been used by Mr. Annin for sending eggs of the brook trout to Europe.

GREEN'S TRANSPORTATION BOX.

Model. A wooden box containing 8 canton-flannel trays for holding the eggs. Nine and one-half inches square; height, 11 inches. Trays, 7 inches square, inside measurement. Devised by M. A. Green. 39,120. Presented by the New York Fish Commission. In imitation of Clark's transportation box.

MATHER'S TRANSPORTATION CRATE.

A wooden box, with a grating of the same material separating it into two compartments, the upper serving as an ice-chamber, while the lower contains 13 canton-flannel egg-trays. The ends of the four pieces which compose the frame of the tray extend an inch beyond the point of intersection to form an air-chamber on each of the four sides of the box, thus giving a free circulation. There is also a slight space between each tray, and a larger one at the bottom. Designed by Fred. Mather, Jersey City, N. J. 39,311. U. S. Fish Commission. A box similar to this one was used in sending salmon-eggs from America to Europe.

PACKING SALMON EGGS.

Photograph showing the method employed in packing eggs of the land-locked salmon for shipment to other hatcheries at a considerable distance. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (766) 2,225. U. S. Fish Commission.

e. ACCESSORIES USED IN TRANSPORTING EGGS AND LIVE FISH.

SIPHON-TUBE.

A piece of five-eighths inch rubber tubing, the lower end of which is incased in a perforated tin tube to prevent the escape of fish

SIPHON-TUBE—Continued.

in removing stale water while in transit. U. S. Fish Commission. 57,156.

SIPHON-TUBE.

A piece of five-eighths inch rubber tubing, 4 feet long, used in connection with the siphon-strainer for removing stale water from cans containing young fish. U. S. Fish Commission. 26,912.

SIPHON-STRAINER.

A tin tube, with funnel-shaped top and perforated tin bottom, 25 inches long and 3 inches in diameter. U. S. Fish Commission. This tube is used when changing the water on young shad, or other species, while in transit. It is placed in the can of fish, the water passing through the strainer before being drawn off by the siphon, the end of which is introduced into it.

STILLWELL'S AERATING PUMP.

A tin tube the lower end of which is incased in perforated tin to prevent the fish from being drawn into it. The spout is also provided with a covering of perforated tin, and the water which is forced through is broken into a great number of minute streams or jets, thus giving complete aeration. Invented by E. M. Stillwell, Bucksport, Me. Presented by E. M. Stillwell. 57,157. This pump is used in aerating the water in which fish are transported, when it is not convenient to procure a fresh supply. In aerating, the pump is inserted in the mouth of the can and the water is pumped up and forced through the perforated tin spout, falling back again into the can.

WATER-BUCKET.

A cylindrical bucket of block tin, provided with a bail and strengthened by iron hoops. Depth, 14 inches; diameter, 12 inches. U. S. Fish Commission. 57,170. This bucket is used in connection with the siphon tubes for changing the water on the young fish while in transit.

9. MODELS AND PHOTOGRAPHS ILLUSTRATING THE HISTORY AND METHODS OF FISH-CULTURE.

HATCHING-TABLE.

In three parts, showing small sized models of the various kinds of hatching apparatus used in the United States, in actual working order, the water being supplied by means of a gas pumping engine which forces it into closed pipes with a pressure of 15 pounds to the square inch. Stop-cocks are placed at frequent intervals in these pipes and are connected with the hatching apparatus by means of rubber tubing. The apparatus is

HATCHING-TABLE—Continued.

supplied with natural and artificial eggs to illustrate better its working. The first compartment contains the closed apparatus, the next the trough and other apparatus requiring running water, while the third is arranged as a basin or artificial lake for showing the floating apparatus and other kinds used in open streams. A McDonald fish-way is placed at the end of the trough to conduct the waste water to the tank below, from which it is again carried to the pump.

TAKING EGGS.

A plaster cast representing a man in the act of taking eggs from an Atlantic salmon in a pan in which they are to be impregnated. By his side are casts of a ripe male and female salmon with the abdominal walls removed to show the ovaries and spermaries in position.

HAULING SHAD-SEINE.

Photograph of employés of the U. S. Fish Commission hauling the seine for shad at the Havre de Grace hatching station, for obtaining ripe fish from which eggs can be supplied to the hatchery. Size, 30 by 40 inches. Havre de Grace, Md., 1882. (660) 2,146. U. S. Fish Commission.

SEINING SALMON.

Photographic view of a portion of the McCloud River, showing the employés of the U. S. salmon hatching station hauling the seine for securing spawning salmon to provide eggs for the hatchery. Size, 8 by 10 inches. Baird, Cal., 1882. (723) 2,189. U. S. Fish Commission.

SEINING SALMON.

Photograph of employés of the U. S. Fish Commission engaged in seining the spawning salmon from the inclosures in which they have been kept till the eggs are sufficiently developed for hatching purposes. Size, 8 by 10 inches. Grand Lake Stream, Maine, 1882. (772) 2,230. U. S. Fish Commission.

HANDLING SALMON.

Photograph of men engaged in transferring salmon from the towing cars in which they have been brought from the fishing-grounds to the inclosure, where they are allowed to remain until ripe. Size, 8 by 10 inches. Bucksport, Me., 1882. (758) 2,219. U. S. Fish Commission.

FISH-CULTURAL OPERATIONS.

Photograph showing a group of men at work salmon fishing, and taking, impregnating, and washing eggs before placing them

FISH-CULTURAL OPERATIONS—Continued.

in the apparatus in the hatchery. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (769) 2,223. U. S. Fish Commission.

TAKING SHAD EGGS.

Photograph of employés of the U. S. Fish Commission engaged in stripping shad at the Sutton Beach Fishery, in Albemarle Sound. Size,.8 by 10 inches. Avoca, N. C., 1877. 2,254. U. S. Fish Commission.

RIPE SALMON.

Photograph of a landlocked salmon with eggs fully matured. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (763) 2,222. U. S. Fish Commission.

TAKING SALMON EGGS.

Photograph of the U. S. Fish Commission spawn-takers engaged in stripping salmon to secure eggs for hatching purposes. Size, 8 by 10 inches. Washington, D. C., 1882. (634) 2,132. U. S. Fish Commission.

TAGGING SALMON.

Photograph of a man fastening a small numbered platinum tag to the dorsal fin of a salmon from which eggs have been taken before returning the fish to the river. This method of tagging is practiced by Mr. C. G. Atkins to give a clue to the movements of the fish that have passed through his hands. Before the salmon is liberated, its length and weight, together with the date, are accurately recorded, and when it is recaptured the same facts are noted, thus giving the growth, and something of the movements, in a known period. Size, 8 by 10 inches. Bucksport, Me., 1882. (756) 2,217. U. S. Fish Commission.

WORK AT CENTRAL HATCHING STATION.

Photograph of employés of the U. S. Fish Commission receiving shad eggs that have been transported from the fishing stations 20 miles distant on the McDonald egg-crates. One man is engaged in unstrapping the crates, another in removing the eggs to hatching jars, while still another is dipping young shad into a can for shipment. Size, 8 by 10 inches. Washington, D. C., 1882. 2,239. U. S. Fish Commission.

PICKING SALMON EGGS.

Photograph of a man at work removing the dead eggs from the hatching trays at Grand Lake stream. It is necessary that the bad eggs should be removed daily, or at intervals of a few days, in order that the adjoining good eggs may not be injured by

PICKING SALMON EGGS—Continued.

contact with them. Size, 8 by 10 inches. Grand Lake Stream, Me., 1882. (767) 2,226. U. S. Fish Commission.

TAGGING SALMON.

Photograph showing the mode of weighing, measuring, and tagging salmon after stripping, in order that a record can be made before turning them loose in the river. Size, 8 by 10 inches. Bucksport, Me., 1882. (765) 2,224. U. S. Fish Commission.

SEINING CARP.

Photograph of men at work seining small carp from the shipping tanks in which they remain after the ponds are drawn off until such time when they can be distributed. Size, 8 by 10 inches. Washington, D. C., 1882. (622) 2,129. U. S. Fish Commission.

SEINING CARP.

Photograph of employés of the U. S. Fish Commission removing the fish from the Government carp ponds for stocking inland waters. The ponds are made lower at one end than at the other, and have several deep trenches leading into a small reservoir where the fish collect and can be readily taken after the water has been drawn off from the ponds. Size, 8 by 10 inches. Washington, D. C., 1882. 2,243. U. S. Fish Commission.

SORTING AND COUNTING CARP.

Photograph of men at work separating the several varieties of small carp and removing the minnows that chance to be found among them. The men are obliged to ascertain the number of each variety of carp while sorting. Size, 8 by 10 inches. Washington, D. C., 1882. (626) 2,130. U. S. Fish Commission.

HAULING SHAD-SEINE.

Photograph of employés of the U. S. Fish Commission hauling the seine for shad at the Havre de Grace hatching station, for obtaining ripe fish from which eggs can be supplied to the hatchery. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Havre de Grace, Md., 1882. (660) 2,146. U. S. Fish Commission.

SEINING SALMON.

Photograph of employés of the U. S. Fish Commission engaged in seining the spawning salmon from the inclosures in which they have been kept till the eggs are sufficiently developed for hatching purposes. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Grand Lake Stream, Me., 1882. (772) 2,230. U. S. Fish Commission.

EXAMINING SPAWNING SALMON.

Photograph showing employés of the U. S. Fish Commission at the McCloud River hatching station examining the live cars to see if any salmon are sufficiently advanced for spawning purposes. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Baird, Cal., 1882. U. S. Fish Commission.

FISH-CULTURAL OPERATIONS.

Photograph showing a group of men fishing for salmon, and taking, impregnating, and washing eggs before placing them in the apparatus in the hatchery. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Grand Lake Stream, Me., 1882. (769) 2,233. U. S. Fish Commission.

TAKING SALMON EGGS.

Photograph showing the U. S. Fish Commission spawn-takers engaged in stripping salmon to secure eggs for hatching purposes. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. (634) 2,132. U. S. Fish Commission.

TAGGING SALMON.

Photograph of a man fastening a small numbered platinum tag to the dorsal fin of a salmon from which eggs have been taken before returning the fish to the river. This method of tagging is practiced by Mr. C. G. Atkins to give a clue to the movements of the fish that have passed through his hands. Before the salmon is liberated, its length and weight, together with the date, are accurately recorded, and when it is recaptured the same facts are noted, thus giving the growth and something of the movements in a known period. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Bucksport, Me., 1882. (756) 2,217. U. S. Fish Commission.

TAKING SHAD EGGS.

Photograph showing employés of the U. S. Fish Commission engaged in stripping shad at the Sutton Beach Fishery in Albemarle Sound. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Avoca, N. C., 1877. 2,254. U. S. Fish Commission.

WORK AT CENTRAL HATCHING STATION.

Photograph of employés of the U. S. Fish Commission receiving shad eggs that have been transported from the fishery stations 20 miles distant, on the McDonald crates. One man is engaged in unstrapping the crates, another in removing the eggs to hatch-

WORK AT CENTRAL HATCHING STATION—Continued.

ing-jars, while still another is dipping young shad into a can for shipment. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. 2,239. U. S. Fish Commission.

SEINING CARP.

Photograph of employés of the U. S. Fish Commission removing the fish from the Government carp ponds for stocking inland waters. The ponds are made lower at one end than at the other, and have several deep trenches, leading into a small reservoir, where the fish collect, and can be readily taken after the water has been drawn off from the ponds. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. 2,243. U. S. Fish Commission.

SORTING AND COUNTING CARP.

Photograph showing men at work separating the several varieties of small carp and removing the minnows that chance to be found among them. The men are obliged to ascertain the number of each variety of carp while sorting. Size, 30 by 40 inches. Enlarged by electric light from an 8 by 10 negative. Washington, D. C., 1882. (626) 2,130. U. S. Fish Commission.

VII.—RESULTS OF FISH-CULTURE.

10. COLLECTIONS ILLUSTRATING THE GROWTH OF FISH.

EGGS SHOWING THE GROWTH OF THE EMBRYOS.

ATLANTIC SALMON.—*Salmo salar*, Linn.

Ova. Prepared at the U. S. Salmon-Breeding Station at Bucksport, Me. Charles G. Atkins, superintendent. A series of eggs in alcohol, showing daily development of the embryo for one hundred and eighteen days, beginning with the unimpregnated egg.

BROOK TROUT.—*Salvelinus fontinalis* (Mitchill), Gill & Jordan.

Ova. Eggs taken from the U. S. Fish Commission trout ponds at Northville, Mich., and shipped to the central hatching station at Washington, D. C., where the series was prepared. U. S. Fish Commission. A series of eggs in glycerine, showing the development of the embryo at regular intervals of two days from a month after the impregnation of the egg to the time of hatching, covering a period of fifty days.

WHITEFISH.—*Coregonus clupeiformis* (Mitch.) Milner.

Ova. Eggs taken in Lake Erie, near Detroit, Mich., and shipped to central hatching station, Washington, D. C., where the series

WHITEFISH.—*Coregonus clupeiformis* (Mitch.) Milner—Continued.

was prepared. U. S. Fish Commission. A series of eggs in glycerine, showing daily development of the embryo from a month after the impregnation of the egg to the time of hatching, covering a period of eighty-three days.

LAKE TROUT.—*Salvelinus namaycush* (Penn.) Goode.

Ova. Eggs taken in Lake Erie, near Detroit, Mich., and shipped to central hatching station, Washington, D. C., where the series was put up. U. S. Fish Commission. A series of eggs in glycerine, showing daily development of the embryo from a month after impregnation to the time of hatching, covering a period of fifty days.

FISH ILLUSTRATING THE GROWTH OF THE FRY.

BROOK TROUT.—*Salvelinus fontinalis* (Mitchill), Gill & Jordan.

Reared at U. S. trout ponds at Northville, Mich. Frank N. Clark, superintendent. A series showing the growth of the young at intervals from the newly hatched fish to the three-year-old trout.

RAINBOW TROUT.—*Salmo irideus*, Gibbons.

Reared at U. S. trout ponds at Northville, Mich. Frank N. Clark, superintendent. A series showing the growth of the young at intervals from the newly hatched fish to the trout two years and a half old.

SCHOODIC SALMON.—*Salmo salar*, Linn. subsp. *sebago*.

Reared at U. S. trout ponds at Northville, Mich. Frank N. Clark, superintendent. A series showing the monthly growth of the young for nine months.

SALMON.—*Salmo salar*, Linn.

Fish probably a year old. New York Fish Commission, Seth Green, superintendent.

COMMON EEL.—*Anguilla rostrata*, (Le S.) De Kay.

Young. October 17, 1877. 20,684. U. S. Fish Commission. This species has a wide geographical range. It spawns in most of the larger streams and in the brackish waters along the coast in the fall, the young eels being seen in immense numbers the following spring.

HERRING.—*Clupea harengus*, Linn.

Young, two days old. Grand Manan Island, N. B. 10,470.

HERRING.—*Clupea harengus*, Linn.

Young, three days old. Grand Manan Island, N. B. 10,461.

HYBRID FISHES.

HYBRID.

Cross between the salmon trout and the brook trout (*Salvelinus fontinalis*). New York Fish Commission, Seth Green, superintendent. This specimen is about a year old.

HYBRID.

Cross between the California salmon (*Oncorhynchus chouicha*) and the brook trout (*Salvelinus fontinalis*). New York Fish Commission, Seth Green, superintendent.

HYBRIDS AND YOUNG FISHES.

A set of five test tubes containing the following specimens:

a. Eggs of shad, *Clupea sapidissima* Wilson, which have been impregnated with the milt of striped bass, *Roccus striatus* Mitch. 31,504.

b. Hybrids hatched from eggs similar to those in *a*, two and one-half days old. 31,505.

c. The same, nine days old. 31,506.

d. Shad, seven days old, eating dead ones of the same age. 31,507.

e. Shad, four days old. 31,508.

ACCLIMATIZATION OF FISHES.

Numerous specimens of shad, Atlantic salmon, California salmon, trout, grayling, and carp, which have been reared in waters where, prior to their introduction by fish-culturists, they did not exist.

11. STATISTICS OF FISH-CULTURE.

LOCATIONS OF HATCHING STATIONS, ETC.

A map showing the operations of the U. S. Fish Commission from 1871 to 1883, the location of the hatching stations belonging to the U. S. Fish Commission, and to the fish commissions of the several States, and the dates of the establishment of the State commissions. It shows the locations where young fish have been planted, each species being designated by a peculiar symbol. The number of shad introduced into the different river basins during the years 1880, 1881, and 1882, and the number of applications for carp from each State that have been supplied, are also indicated by colored figures. (See also reports of U. S. Fish Commission and of the various state commissions for statistics of eggs taken and fish hatched.)

12. LITERATURE OF FISH-CULTURE.

NORRIS, THADDEUS. 39,129.

American | Fish-culture | embracing all the details of | artificial breeding and rearing of trout; | the culture of salmon, shad

NORRIS, THADDEUS—Continued.

and other | fishes. | By Thaddeus Norris, | Author of "The American Angler's Book." | Illustrated. | [Seal of the publishers.] | Philadelphia: | Porter & Coates. | London: Sampson Low, Son & Co. | 1874.

GREEN, SETH. 39,130.

Trout Culture | by | Seth Green. | — | Published by Seth Green and A. S. Collins, | Caledonia, N. Y. | — | Rochester, N. Y.: | Press of Curtis, Morey & Co., Union and Advertiser Office. | 1870.

GREEN, SETH, and ROOSEVELT, R. B. 39,133.

Fish Hatching, | –and– | Fish Catching. | — | – | by– | R. Barnwell Roosevelt, | Commissioner of Fisheries of the State of New York, | Author of | Game Fish, etc., etc., | and | Seth Green, | Superintendent of Fisheries of the State of New York. | — | Rochester, N. Y.: | Union and Advertiser Co.'s Book and Job Print. | 1879.

SLACK, J. H. 39,132.

Practical | Trout Culture. | By | J. H. Slack, M. D., | Commissioner of Fisheries, N. J.; Natural History Editor of "Turf, | Field, and Farm," N. Y.; Proprietor of Troutdale Ponds, near Bloomsbury, N. J. | — | "We speak what we do know, and testify what we have seen." | — | New York: | Geo. E. Woodward. | -- | Orange Judd & Co., | 245 Broadway. | 1872.

GARLICK, THEODATUS. 39,128.

A Treatise | on the | Artificial Propagation | of | certain kinds of Fish, | with the | description and habits of such kinds as are the most | suitable for pisciculture. | — | By Theodatus Garlick, M. D., | Vice President of Cleveland Academy of Natural Science. | — | Giving the author's first experiments contained in a paper read | before the Cleveland Academy of Natural Science. | Also, | directions | for the most successful modes of angling for such kinds of | fish as are herein described. | — | Cleveland: | Tho. Brown, Publisher, Ohio Farmer Office. | 1857.

STONE, LIVINGSTON. 39,131.

Domesticated Trout. | How to Breed and Grow them. | By Livingston Stone, | United States Deputy Fish Commissioner, in charge of the United States Salmon Breeding Station on the Pacific Coast; etc., etc. | "*Purpurisque Salare stellatus tergora guttis.*" | Ausonius, Idyl Tenth. | "Make assurance doubly sure." | Macbeth, Act IV., Scene 1. | Third Edition, | Revised and Enlarged. | [Cut of fish.] | Charlestown, N. H. | For sale at the Cold Spring Trout Ponds. | 1877.

ATKINS, CHARLES G. 39,144.

U. S. Fish Commission. | — | Cheap Fixtures | for the | Hatching of Salmon. | By | Charles G. Atkins, | Assistant, U. S. Fish Commission. | — | Washington: | Government Printing Office. | 1879.

WILSON, SIR SAMUEL.

The | Californian Salmon | with an account of its | Introduction into Victoria. | By | Sir Samuel Wilson | Member of the Legislative Council of Victoria, | — | Melbourne: | Sands & McDougall, | Printers, Collins Street, West. | 1878.

(See also Reports of the various Fish Commissions and Fishery Societies.)

INDEX OF NAMES MENTIONED.

Page.

A

Abbe, W. A 20, 29, 97, 1153
Abbey & Imbrie 944
Abbott, C. C 481
Aberdeen Packing Company 1070
Academy of Natural Sciences 539, 540
Ackley, Lieutenant 563
Adam, J. G 1017, 1022
Adams, Lieut. G. R 166, 173, 178, 180
Mayhew 29, 91
Agassiz, Alexander 29, 100, 103, 104, 563, 567, 570, 597, 601
Zoological Laboratory 597–599
Aiken, C. E 147, 426
& Swift 310
Ainsworth, S. H 29, 1228
Alabama Fish Commission 1160, 1180
Alaska Commercial Company .29, 98, 103, 1118, 1127
Albany-Beef Packing Company 29, 96, 97, 1108, 1117, 1133, 1135, 1136, 1150, 1154
Alden, Charles 29, 96, 805, 1102
Allen, C. A 170
C. S 148
Frederick S 12, 89, 91, 93, 330, 341, 349, 725, 872
J. A 8, 29, 103, 104
J. & S 949
Oliver 285
Almy, D. D 1050
Alpena hatching station ..1171, 1219, 1220, 1221, 1226
American Angler 30, 104
Field 30, 104
Fish Cultural Association ..30, 104, 1163, 1175, 1176, 1190, 1191
Museum of Natural History ... 159, 539
Net and Twine Company 30, 89, 92, 987, 988, 992, 993, 996, 1006, 1009, 1013, 1019, 1021
Sardine Company 1084
Ship Windlass Company 12, 31, 91, 545, 724
Whip Company 1132
Ames, James T 264
Amherst College 540
Ams, Max 32, 96, 1081, 1107, 1112, 1113
Anderson, Dr. C. L 612, 620
Annin, jr., James 32, 98, 99, 1175, 1239
Antisdell, John F 1175
Arizona Fish Commission 1160
Arkansas Fish Commission 1160
Army Medical Museum 1103
Astoria Packing Company 1070

Page.

Atkins, Charles G 24, 32, 99, 425, 1202, 1204, 1205, 1209, 1219, 1249
Atwood, Capt. N. E 642, 1055, 1146, 1147, 1150
Atwood Brothers 32, 91, 766
Averill, H 612
Avoca hatching station 1170, 1219

B.

Babcock, Dr. W. H 1147
Babson, Capt. Fitz J 815
Badollet & Co 32, 96, 1069
Bagnall & Loud 32, 91, 739, 740, 752, 972
Bailey, A. H., & Co 33, 96, 1067, 1068, 1072, 1080, 1083, 1084, 1086, 1087, 1107 1113, 1116
Bailey, S 419
Bailie, W. L 34, 100, 591
Baird, Prof. S. F 146, 151, 152, 155, 163, 180, 430, 446, 448, 449, 451, 463, 465, 466, 467, 468, 469, 471, 479, 480, 481, 483, 484, 486, 487, 489, 491, 492, 493, 570, 608, 640, 885, 1014, 1023, 1128, 1160, 1162, 1174, 1191, 1192
Baird hatching station 1171, 1223
Baker, Amos C 351
Benjamin 34, 90, 999, 1021
George O., & Co 1064, 1065, 1066
Bannister, H. M 407, 408, 415, 470
Barnston, G 493
Bartlett, I. H., & Sons 34, 91, 97, 98, 301–304, 320, 1129, 1130, 1144, 1145
John 104
S. P 1174
Barton, James 34, 89, 326, 344
Batty, J. H 158, 159, 169
Beale, A. C 148
Bean, Dr. Tarleton H 34, 103, 104, 129, 379, 380, 387, 405–421, 426, 465, 467, 476, 477, 485, 491, 492, 608, 886, 1197
Beardslee, Commander L. A 412, 922
Beardsley, Wilson 252, 252, 253, 254, 255
Beardsley's Sons, J. W ... 96, 1087, 1101, 1102, 1106
Beebe, Mrs 612
Beetle, James 34, 98, 300, 695, 867, 1050
Rudolphus 34, 102
Belbin, C. S 267, 855
Belding, L ... 144, 150, 157, 160, 168, 169, 176, 181, 184
Belknap, Capt. G. E 589
Bell, Charles F 1213
J 142, 143, 144, 155, 164
J. G 166, 181
Belmont, Perry 1175
Bendire, Capt. Charles .424, 425, 459, 473, 480, 494, 609

Page.
Benedict, James E.....34, 100, 562, 574, 577
Bergland, Lieut. E 637
Bessels, Dr. Emil..... 920
Bischoff, F 149, 150, 163, 168, 170, 173, 178
Bishoff, S 132, 420
Bishop, John 687
Blackford, E. G 6, 34, 98, 102, 127, 128, 129, 253, 254, 256, 257, 259, 260, 262, 266, 400, 427, 461, 475 608, 1111, 1175, 1192, 1196
Blanchly, C. P..... 183
Blatchford, Edwin 844
Blish, Midshipman J. B..... 247
Bliss, John, & Co 34, 91, 726, 727
Boardman, G. A 149
Bogart, J. P..... 253
Bogert & Co 1073
Booth, A..... 35, 96, 270, 1051, 1069, 1074, 1094, 1108, 1110, 1115
Miss M. A..... 612
Boston Packing Company.....1081, 1087
Boston Society of Natural History 539
Bourne, Jonathan 35, 89, 309, 311, 312, 325, 336, 338, 342, 343, 345, 346, 348, 349, 352, 353, 844, 845, 872
Bowdoin College 540
Bower, Seymour..... 1214
Bowman, S. C 151
Brackett, E. A.....35, 99, 1204, 1211
Walter M..... 35, 102
Bradford & Anthony 264, 910, 911, 924, 931, 945, 953, 959, 966, 967
Brainard, Herbert..... 1175
Brand, C. C 285, 321
Junius A... 35, 89, 285, 286, 321, 328, 329, 332
Brasher, P 693
Brewer, James D 35, 99, 1203
Brewster, W.....149, 159, 161, 163, 171
Brooks, Dr. W. K..... 198, 248
Brown, Edward O 816
James Temple.....35, 89, 268, 271, 629, 831, 855, 856, 861, 1127, 1129
Robert 281, 284
Theodore 759
Brown University..... 540
Brush Swan Electric Light Company 35, 102
Bryan, O. N 35, 99
Bryce, T. T 1075, 1079
Bucksport hatching station.....1170, 1171, 1218, 1219, 1222
Burnham, David 687
Jeremiah..... 681, 685
Willard R..... 683
& Morrill.... 35, 96, 1072, 1073, 1078, 1080, 1087, 1107, 1109, 1110, 1116
Burt, Hannah M..... 843
Butler, A. P 1175
W. H..... 1175
Butler University..... 541
Buttrick, J. T.....36, 95, 355

C.

California Academy of Sciences..... 540
Fish Commission.....1159, 1180
Packing Company 1068
Cameron, Daniel..... 1175
Cape Ann Isinglass and Glue Company.1133, 1134, 1135
Carley, B. J. M.....251, 252, 253, 254, 255, 256, 257, 258, 259, 261
Carpenter, Charles.....36, 91, 965
Cassin, J..... 145
Castine Packing Company.....96, 1073, 1078
Central Wharf Company..... 794, 844
Chapman, W. D..... 979
Chase, A. J 37, 98, 1051
Owen M 37, 99, 1212
William H..... 267, 300
jr., W. H..... 692, 694
2d., W. H 700
Chester, Capt. H. C 37, 98, 99, 100, 267, 356, 560, 566, 574, 671, 674, 696, 700, 758, 850, 920, 1050, 1127, 1217
Chicago Academy of Sciences..... 156, 540
Church, Joseph, & Co 1091, 1092, 1093
Clark, A. Howard 8, 37, 103, 104, 295, 629, 831, 962, 1031
Frank N 24, 37, 38, 99, 422, 426, 427, 469, 1213, 1220, 1231, 1237, 1246
Frank W..... 1211
J. H..... .....451, 483, 1127, 1128
Nelson W..... 1211, 1238
T. W. B 259, 265
Clarke, James B.....38, 91, 765
Claughton, H. O 1018
Clay, Capt. Henry 38, 92, 352
Cleveland, D 612
Capt. Josiah 1018, 1019, 1021
Capt. William H 696
Coale, H. K.....152, 181
Cobb, Nathan 254
Codman & Shurtleff..... 578
Coffin, J. W 28, 92, 355, 357, 1131
Cold Spring hatching station.....1170, 1218, 1219
Cole, Charles A 38, 98, 1144
Luther 38, 89, 305, 309, 315, 326, 330, 335, 337
Coleman, Walter, & Sons.....738, 739, 740, 741, 742, 752, 754, 758, 759
Collins, A. S.....38, 99, 1229
Capt. J. W 38, 39, 40, 43, 92, 105, 174, 183, 645, 688, 691, 709, 732, 733, 774, 775, 818, 913, 914, 915, 916, 918, 919, 985, 999, 1199
Paul E..... .. .. 40, 89
Colorado Fish Commission..... 1180
Columbia River Packing Company..... 1068
Colyer, Vincent 384, 877, 1119
Comstock, Oscar 1175
Conklin, Capt. B. F 40, 104
W. A 1175
Connecticut Fish Commission 1159, 1160, 1181
Connell, D 40, 89, 319
Conrad, Mr..... 260
Conroy & Bissett 40, 41, 93, 94, 814, 943, 979
Cook, Capt. Caleb.....41, 97, 1147
Coleman 905
E. H..... 1129
E. K..... 314
Edward P..... 247
Elisha..... 927
H. & S 41, 91, 689

Page.

Cook, J. W. & V.... 1108
Lemuel.... 314, 863, 909
N. N 95, 355
Stephen 41, 89, 317, 342, 343
W. H. & Co.... 308, 312, 326, 339
Cooper, W. A 147, 163, 179
Copeland, Chas. W 543, 550
Cornell University.... 541
Cornwall & Weston.... 698
Couch, Lieut. D. N.... 441
Coues, Dr. E.. 144, 146, 147, 148, 149, 150, 151, 152, 154, 156, 162, 168, 169, 172, 176, 177, 180, 482
Court, J. W., & Co.... 927
Cowdrey, E. T., & Co.... 1066, 1068, 1071, 1074, 1077, 1081, 1085
Cox, Capt. James V.... 73, 92, 293, 308, 351, 352
Cragin & Sheldon.... 697
Craig, Dr. T. C.... 175
Crandall, L., & Co.... 950, 952
Crittenden, A. R.... 262, 310, 311, 314, 339, 728, 755, 756, 864, 873, 972, 1129
R. D.... 416
Crocker, A.... 155, 156
Cunningham, Patrick.... 89, 280, 281, 286, 325, 331
& Cogan.... 279, 285
Curley, Rev. James 1120
Cutting, Hiram A 1175
Packing Company.... 41, 96, 1067, 1069, 1087, 1109
Cuvier Club, Cincinnatti, Ohio.... 160, 161

D.

Daborich, C., & Co.... 1070
Dall, W. H 8, 41, 103, 105, 151, 180, 244, 245, 252, 254, 258, 260, 378, 379, 380, 382, 393, 394, 399, 408, 409, 410, 411, 413, 415, 423, 457, 600, 641, 836, 849, 869, 874, 887, 888, 889, 892, 898, 899, 921, 923, 1014, 1119, 1120, 1126
Dalzell, Robert.... 1175
Darby, P. H.... 1174
Davis, Mrs. A. S.... 612
Edward 843
Frank E.... 41, 92, 767
Dawson, Mr.... 254
Dayton, E. A.... 491
F. C.... 245, 246, 251, 254, 262
De Butts & Daggetts.... 41, 96
De Frece, A. B., & Co.... 245, 264
Delaware Fish Commission 1160, 1181
Delawder, W. G.... 42, 99, 1174
Dickson, DeWolf & Co.... 1068
Dixon, R.... 255
Dodd, A. W., & Co.... 42, 97, 1147, 1149, 1154
Donnell, J. T 42, 91, 722
Dorflinger Glass Company 579
Douglass, Mark 1175
Drake, A. W 823
Dresser, J. W.... 42, 89, 951, 956
Drew, Benjamin F 42, 95
Drexler, C 147, 149, 169
Driggs, James D 42, 89, 308, 327
J. W 143, 144, 156
Drouet, H 162
Dunan, Winfield S 20, 42, 97, 1147, 1153

Page.

Dunbar's Sons, G.... 129, 607, 1076, 1079
Dwight, H. P 1175

E.

Eagle Preserved Fish Company... 1067, 1083, 1084, 1086, 1089
Earll, R. E.... 42, 99, 105, 128, 443, 445, 449, 455, 825, 862, 911, 912, 913, 1155, 1169, 1192, 1198, 1199, 1200
Eastern Packing Company.... 1072
Eastport Packing Company.... 1076, 1109
Eaton, Prof. D. C 612, 620
Edmonds, M. C 425, 472, 474
Edmunds, R. H.... 1053
Edwards, Vinal N 131, 247, 265, 427, 1169, 1193, 1194, 1195, 1197, 1200
Eggers, sr., Selma 43, 89, 323
jr., Selma 43, 89, 866
Eliot, D. G 148
Elliott, Henry W 5, 43, 90, 105, 149, 151, 153, 161, 165, 166, 167, 174, 178, 119, 180, 183, 381, 625, 709, 834, 848, 852, 883, 891, 905, 913, 914, 915, 918, 919, 921, 990, 996, 999, 1017, 1018, 1020, 1026, 1027
Society, Charleston 540
Elwell, jr., Samuel 265, 751, 776, 839, 840, 843, 844
Emerton, J. H.... 6, 43, 101, 243
Eureka Packing Company 1068
Evarts, Charles B 1175
Everleth, F. M 99
Everson, James L 43, 94

F.

Fairbank, N. K.... 1174
Fairbanks & Co.... 43, 98, 1095
Farlow, Dr. W. G.... 7, 43, 101, 105, 612, 620
Faxon, Walter 43, 105
Feilner, Capt. J 156
Fencker, Governor.... 173, 178, 179, 183
Fenner, C. A 703
Ferguson, Albert.... 43, 44, 94, 812
Maj. T. B 23, 44, 99, 254, 266, 267, 673, 674, 708, 851, 1169, 1210, 1216, 1219, 1229, 1230
Fewkes, J. Walter.... 45, 105
Fish, Alex.... 256, 257, 258, 261
Fisher, Capt. J. G.... 308
W. J.... 182, 393, 395, 398, 408, 411, 417, 418, 420, 884, 893, 960
Fitzhugh, jr., D. A 702
Fletcher, Calvin 1174
W. W 422
Foote, A. A.... 260
Forest and Stream Publishing Company. 45, 105
Foster, Al 45, 91
J. W 1128
G. P.... 840, 841, 962
Fowles, J. F 816
Freeman, Mrs. J. H.... 45, 102
Sandford 779, 843, 844
& Lincoln.... 319
Fulton Market Fishmongers' Association. 45, 104

G.

Gandy, J. W.... 253, 256, 257, 261
Gannett, Mrs. E. A.... 45, 92, 351

Page.

Gardiner, Capt. J. W. T 994
Garlick, Theodatus 1159, 1169, 1208, 1248
Georgia Fish Commission 1160, 1181, 1182
Ghenn, Capt. Josiah 284
Gibbes, Dr. L. R. 612
Gibbs, George 707, 776, 833, 851, 869, 897, 923
Gifford, J. D 692
Gilbert, C. H 421, 424, 425, 426, 461, 473, 480, 489, 541
E. F 264, 265, 1128
Giles, John D. S 45, 95
Gilliss, J 447
Gloucester Fishermen's and Seamen's Widows and Orphans Aid Society 667, 668, 669, 816, 817
hatching station 1169
Isinglass and Glue Company 19, 45, 46, 47, 48, 97, 1126, 1127, 1134, 1135, 1136, 1151
Goode, F. C 442
G. Brown 6, 8, 103, 400, 445, 446, 448, 472, 732, 756, 779, 780, 831, 860, 902, 1000, 1037, 1126, 1161
Gosper, J. J 1174
Gordon, Alexander 251, 258
Graham, J. B 1017
J. D 459, 472
Grand Lake Stream hatching stations .. 1170, 1171, 1218, 1221, 1222
Grant, M. W 268, 860, 927
Graves, A 461, 463
Frederick D 698, 771
J. L 975
Grayson, Col. A. J 145, 163, 165, 166, 172, 641
Green, G. L 1020
Monroe A 48, 94, 99, 927, 1229
Seth .. 48, 99, 1159, 1169, 1175, 1211, 1212, 1249
Griffith, William 1174
Gruber, F 165, 170

H.

Habersbaw, Frederick 1175
Hall, C. D 267
Capt. C. F 377, 379, 383, 385, 850, 877, 883, 885, 919
Rev. E 612
M. E 474
& Pearsall 1106
Hallett, Albert 694
Hallock, Charles 1175
Halstead, Mrs. B. D 612
Hamilton, Mr 143
Hardy, M 182
Harger, Oscar 49, 105
Harrington, C. B 688
Harris, L. A 1175
Harvey, G. W 252, 253, 254, 257, 259
& Ford 1128
Haskell, jr., Edward P 322
Haven, Williams & Co 49, 97, 1145, 1146
Hawley, Wheeler 253, 255, 259
Hay, O. P 465, 468, 482, 484, 489, 493
Hayden, Dr. F. V 1118
Hayes, Dr. I. I 383, 885
Hays, Dr. W. W 181

Page.

Haywood, F. W 607
William P 49, 90, 858
Heath, L. J 262
Hedges, S. P 867
Heermann, Dr. A. L .. 147, 153, 163, 173, 182, 183, 488
Hegeman Portable Folding-Boat Company 703
Heman & Bannister 1086
Hemphill, H 127, 129, 131, 244, 245, 254, 258, 260, 263, 612
Henderson, J. T 1174
Hendley, J. E 49, 95, 783
Henshall, Dr. J. A 429, 437, 444, 446, 448, 450, 451, 452, 453, 455, 470
Henshaw, H. W 145, 147, 148, 150, 152, 153, 154, 156, 158, 159, 165, 168, 169, 172, 183, 478, 487, 488, 489
Hepburn, J 146
Herendeen, E. P 407, 1102
Hesbolt, W. H 268, 781, 847, 863
Hessel, Rudolph 1169
Hewit, B. L 1175
Higgins & Gifford .. 49, 92, 93, 697, 739, 762, 822, 1094
Hill, L. S., & Co 49, 93, 94
Hilgard, J. E 49, 100, 595, 596, 599
Hillman, Uno H 1151
Hinckley, I 157, 158
Hine & Co 49, 96, 1067, 1074, 1079, 1107, 1108, 1110, 1111
Hirst, F 459
Hobbs, G. S 247, 253, 254, 258, 265
Holberton, Wakeman 49, 50, 93, 94, 810, 945
Holden, J. B 429, 432
Holmes, Frank 50, 51, 94, 705
Marshall H 51, 52, 93, 823
Holton, M. G 1169, 1210
Hooper, F. W 612
Capt. C. L 394, 417, 418, 422, 424
W. E., & Sons 992, 999
Hooper's Sons, William J 52, 92
Hopson, W. P 1175
Horan, H 183
Hornaday, W. T 52, 102, 103
Hornibrook, J. H 1174
Howard, Capt. W. A 868, 869, 874
Howe & Odell 1085
Howell, Benjamin P 1175
jr., Benjamin P 1175
Commander J. A 587
Howland, Capt. L. W 300
Hoy, Dr. P. P 459
Hoyt Brothers 251, 252, 253, 254, 255, 258, 259
Hudson, Dr. W. M 1174
Hughlett, Thomas 1174
Hume, Joseph 1070
G. W 1070
R. D 1070, 1071
S. B 1106
William 52, 96
& Co 1069
Hummel, John 1175
Hunt, A. G 265
Hurlburt, R. H 262, 864
Huske, C. J 1175
Hutchinson, Charles M 1175

Page.

I.

Ichthyophagous Club 52, 104
Illinois Fish Commission.....1160, 1182
Indiana Fish Commission 1160, 1182
Ingersoll, Ernest..... 187, 190
Interior Department 78, 104, 525
Iowa Fish Commission 1160, 1182
Irving, Thomas A..... .....52, 91, 681

J.

Jackman, M. B., & Co..... 949, 956
Jacoby, Master H. M..... 560
Jackson, Charles A..... 694
James, W. H..... 930
Jenks, Prof. J. W. P..... 181
Jewett, Colonel..... 264
John Russell Cutlery Company..837, 838, 840, 1096
Johns Hopkins University..... 541
Johnson, S. M..... 1175
& Young 129, 674, 693, 1020, 1090
J. B..... 1169
Jones, J. Winslow.....1068, 1071, 1073, 1077, 1085
William Wortley..... 1078
Jordan, Prof. D. S.....52, 103, 105, 389, 421, 424, 425, 426, 430, 431, 433, 434, 435, 441, 442, 443, 449, 455, 456, 457, 460, 461, 463, 464, 465, 466, 467, 471, 473, 480, 482, 484, 485, 486, 489, 1018, 1103, 1104, 1105
Jouy, P. L. 147,154, 171, 469

K.

Kaiser & Martin 456
Kansas Fish Commission 1160, 1182
Keergaard, F. C., & Co..... 1132
Kelleher, Daniel.....52, 90, 283, 326, 351, 354, 356, 357, 1129
Kelley, Zeno..... 317
Kellog, A. J..... 1174
Kemp, Day & Co.....1071, 1073, 1074, 1076
Kennedy, B. E. B 1175
Kennerly, Dr. C. B..... 488
Kennicott, R 475, 994
Kentucky Fish Commission.....1160, 1182
Kidder, Dr. J. H..... 173
Kilbourne, S. A 902
& Goode..... 6
King, Robert..... 414
Kingsbury, Dr. C. A. 1175
Kinney, W. S 1071
Kirby, Humphrey S..... 333, 344, 866
Klett, Francis..... 484
Knowles, John P..... 53, 92
George.....52, 95, 103, 355
Thomas, & Co..53, 90, 313, 318, 331, 337, 339, 340, 341, 349, 350, 354, 838, 844
Kohler, J 152
Kohn, Gustav.....129, 260, 261, 265
Kumlien, L..... 147, 149, 154, 161, 162, 168, 179, 183, 422, 427, 492

L.

Laing, Dr. J. M..... 428
Langdon, F. W..... 160
Latham, James H.....731, 1019, 1030
Lawrence, George N 165, 1176
Mills Company..... 722
& Co.....53, 90, 306, 307, 308, 315, 316, 318, 322, 327, 349, 352, 353, 354, 355, 356, 357, 833, 836, 844, 848
Ledyard, L. W..... 440
Leslie, C. C..... 258, 259
Lewis, William..... 53, 90, 323, 329
W. K., & Brother.....53, 95, 96, 803, 804, 1067, 1074, 1107, 1109, 1110, 1111
Lindenkohl, A 599
C 8
H..... 599
Livingston, R. R..... 1175
Lockhart, J..... 177
Lockington, W. N 53, 105
Logan, J. S 1175
Loomis, Plumb & Co..... 93, 94, 969
Long, D. B..... 1174
Lord, H. & G. W 92, 952, 953, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1015, 1016
Lothrop, L. D..... 963
Love, Thomas J 251, 252, 253, 254, 257, 259, 262
Low, David W.....53, 98, 864, 1052, 1053
Lowery, N. M..... 1175
Lucas, F. A..... 53, 102, 129
Lyceum of Natural History, New York.. 539
Lyman, Theodore 1175
Lytle, A. E 423

M.

Macy, E. B. & F.. 309, 333, 334, 335, 336, 337, 340, 345
Macy, Joseph B.. 55, 90, 306, 307, 313, 314, 316, 318, 328
MacFarlane, Robert 153, 386, 868, 878, 888, 898, 985, 988, 993, 1027, 1129
Mackey & Pindar 54, 90, 306, 309, 340, 345
Madsen, Peter 459, 478, 485, 487
Mahrenholz, H. J.....19, 55, 98, 1125
Maine Fish Commission 1159, 1160, 1182, 1183
Maine Packing Company 1076
Maltby, C. S 1074, 1075
Maltby & Edwards 1074, 1079, 1085
Mann, John, & Co 94
John H..... 930
Mann Brothers 55, 98, 270, 1095
Mansfield, G. H., & Co 946, 947, 948, 949, 953
March, W. T 145, 166
Marchant, C. B 55, 90, 330, 331
Marfil, R..... 474
Marford, Theodore 1176
Marine Zoological stations 597–599
Marshall, Henry..... ..... 55, 102
Martin, Capt. S. J 671, 862, 1090
Maryland Fish Commission.....1160, 1183
Maryland Packing Company..... 1079
Mason, H. W 55, 90, 279, 281, 286, 316, 320
Mason & Quinn 462
Massachusetts Fish Commission ..1159, 1160, 1183, 1184
Humane Society.....55, 93, 823
Mather, Fred.....6, 55, 99, 102, 103, 1169, 1176, 1213, 1229, 1239
Mathew, G. F..... 255, 260

Page.

Matthews, Dr. W 706
May, Lieut. S. H 588
W. L 1175
Maynard, C. J 160, 164, 165
Mayo, Henry, & Co 56, 95, 96, 804, 805, 1066, 1068, 1072, 1077, 1080, 1081, 1082, 1083, 1084, 1086, 1107, 1110, 1111, 1113, 1114
McAdams, William 493
McAskell, Daniel 864
McCaleb, Vinal 872
McClain, Capt. G. M 687
McCloud River hatching station ... 1171, 1172, 1238
McCullough, John 54, 90, 304, 306, 310, 315, 316, 349, 351, 845
McCurdy, Alex 758, 845, 853, 860, 861, 909, 974
McDoel, S. P 1174
McDonald, Col. Marshall 54, 99, 129, 459, 470, 471, 477, 607, 608, 753, 1169, 1175, 1206, 1214, 1215, 1237, 1238
McGovern, H. D 54, 102, 1176
McIntire, Charles H 693
McKeim, Hon. George 898
McKinnon, Daniel 601
McKesson & Robbins 54, 99, 101, 132
McKay, C. L 378, 379, 381, 382, 383, 384, 386, 706, 765, 835, 848, 851, 871, 877, 884, 885, 887, 893, 894, 896, 901, 920, 964, 973, 1014, 1018
McLaughlan, W. B 1022
McLean, John J 834, 922
McMenamin & Co 54, 96, 1075, 1076, 1078, 1079, 1085, 1110, 1114
McQuaid, P 437
Megler, J. G., & Co 1108, 1109
Merchant, jr., Capt. George 56, 90, 95, 739, 740, 818, 819, 843, 984, 1001
Capt. Phillip 834
Merrill, Dr. J. C 177
Michigan Fish Commission 1160, 1184
Middleton, S. J 252
Milam, B. C 56, 57, 94, 969
Miles, George W 20, 87
Miller, Henry B 1175
L. M 492
S. B 1176
Mills, William, & Son 58, 59, 93, 94, 925, 926, 927, 929, 931, 948, 950, 959, 968, 969, 979
Milner, J. W 142, 422, 423, 450, 454, 455, 456, 458, 460, 461, 468, 469, 470, 472, 473, 478, 482, 485, 494, 701, 987, 1062, 1192, 1193, 1196
Mintzer, Lieut. W. A 180, 377, 379, 875, 877, 885, 906, 915, 1160, 1185
Mississippi Fish Commission 1160, 1185
Missouri Fish Commission 1160, 1185
Mitchell, William 56, 60, 93, 94, 969, 980
Monsell & Dewing 251, 252
Moore, Enoch 1174
C. R 157
Morris, William 906, 1029
Moses, Dr. O. A 545
Mosher, A. A 1174

Page.

Mott, Mrs. C. E 264
Murdoch, John ... 146, 149, 150, 153, 157, 161, 162, 173, 181, 182
Museum of Comparative Zoology 60, 105, 536, 539, 608, 609

N.

Navy Department 78, 91, 529–535
Nebraska Fish Commission 1160, 1185
Neill, Allan 256, 257, 261
Nelsen, Chresten 60, 91, 734, 1015
Nelson, E. W. 146, 150, 152, 154, 156, 157, 158, 159, 162, 163, 165, 168, 169, 171, 173, 176, 177, 178, 181, 182, 183, 378, 380, 381, 382, 383, 384, 385, 391, 404, 410, 416, 421, 423, 424, 706, 750, 751, 799, 821, 835, 836, 847, 848, 849, 850. 851, 854, 869, 870, 876, 878, 879, 880, 881, 883, 884, 886, 888, 889, 890, 893, 895, 897, 899, 900, 959, 985, 1018, 1021, 1119, 1126
Peter 821
Nevada Fish Commission 1160, 1185
New Bedford Cordage Company 61, 90, 346, 347, 348
Newberry, Dr. C. G 148, 489
J. S 487
Newcomb, R. L 153
New England Glass Company 577
New Hampshire Fish Commission 1159, 1160, 1185, 1186
New Jersey Fish Commission 1159, 1160, 1186
New York Fish Commission .. 1159, 1160, 1186, 1187, 1239, 1247
Nichols, B. F 61, 62, 94, 981
Capt. Henry E ... 390, 391, 407, 408, 409, 412, 414, 415, 418, 420
Nickerson, George Y 377, 384, 894, 965, 1127, 1128, 1132
& Baxter 61, 90, 927
Niles, F. G 130
Lieut. Kossuth 252, 254, 258
Norris, Thaddeus 1247, 1248
North Carolina Fish. Commission 1160
North Pacific Exploring Expedition .. 532, 533, 534, 869, 873, 874, 885, 892, 993
Northville hatching station ... 1171, 1219, 1225, 1226
Norton, John W 62, 92, 350
Noyes, W. M 386, 417
Nunn, R. J 130

O.

Ober, F. A 164, 166, 167, 175
Ocean Trout Company 1067
Occident Packing Company 1071
Ohio Fish Commission 1160, 1187
Old Colony Mills 12, 62, 91, 722
Oregon Fish Commission 1160
Packing Company 62, 96
Orphans' Aid Society 666, 667, 668, 669, 816, 817
Osborn, Capt. J. E 351
Osborn & Co 317
Osborne, James C 63, 90
jr., Samuel, & Sons 63, 90
Osgood, N. A 63, 94, 98, 702, 984
Ostermoor, H. D., & Son 93, 823

P.

Page.

Packard, jr., A. S 63, 105
Paddock, Thomas B 63, 90
Page, E. W., & Co 13, 63, 92
Palmer, Dr. Edward 146, 149, 612, 920, 1029, 1104, 1105, 1119
J 63, 259
William 243, 490
Parker, C. H 265
H. G 141
Joel C 63, 99, 1216
Parmalee, D. D 1023
Parsons, Charles 843
John B 864
Capt. W. B 63, 90, 731, 846
Payne, N. H 1129
Peabody, George H 1147
Peakes, Thomas M 63, 92, 351
Pease, Charles 165, 1176
Pelton, W. T 265
Pennsylvania Fish Commission 1159, 1160, 1187
Perkins, C 164
& Shurtleff 63, 96, 1101
Petroff, Ivan 398
Phillips, Barnet 63, 104
William, & Son 64, 90, 321
Pickert, L., & Co 64, 95, 96, 804, 1067 1073, 1078, 1081, 1082, 1083, 1086, 1087, 1088, 1106, 1107, 1109, 1110, 1111, 1114, 1116, 1117
Picking, Commander Henry F 64, 92
Pierce, Capt. Eben 64, 90, 280, 286, 315, 318, 329
Jason S 251, 254, 255, 257
& Eggers 279
Pike, Robert G 64, 99, 1174
Platt & Co 1076
Poland, jr., Daniel 688
Porter, Thomas E 1176
Portland Packing Company 65, 96, 1072, 1073, 1077, 1081, 1109
Society of Natural History 539
Post, H. C 1175
Potter, Charles T 1023
& Wrightington 95, 96, 803, 1057, 1066, 1067, 1071, 1072, 1073, 1077, 1080, 1081, 1082, 1083, 1086, 1087, 1089, 1105, 1106, 1107, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117
Potts, Edward 65, 100, 101, 609
Powers, S 707, 806, 875, 906, 920, 921, 988, 1102, 1103
Pratt, Capt. R. H 143
Prentiss, Dr. D. W 148
Price, W. C 1174
Princeton College 541
Proctor, G. W 66, 90, 319
J. O 817
Proctor Brothers 66, 105, 820
Pryer, Jasper 66, 97, 1144, 1145, 1146, 1147
Pusey & Jones Company 23, 544, 550, 1221
Putnam, F. W 66, 105, 1174

Q.

Quinn, James 66, 96
Quinnipiac Fertilizer Company 20, 66, 97, 1153

R.

Page.

Rathbun, Richard 66, 101, 105, 107, 511
Rau, Dr. Charles 66, 104
Ray, Lieut. P. H 380, 382, 384, 385, 847, 850, 871, 882, 883, 886, 887, 895, 896, 901, 1030, 1120
Reardon, John E 1174
Recht, C 94, 959
Redman, Capt. F. M 905, 912
Rhode Island Fish Commission 1159, 1160, 1188
Ricardo, George 66, 99, 1216
James 1169
Rich, Newell B 928, 962
Richard, J. H 462
Ridgway, C. W 160
J. L 159, 181
Robert 67, 105, 139, 145, 148, 152, 159, 160, 161, 167, 171, 172, 177, 183, 607
Ridgway Patent Refrigerator Company 67, 98, 1051
Richardson, James 259
Nathan 66, 92, 725
Riley, Prof. C. V 9, 67, 102, 105
Ring, Lieut. F. W 875
Roberts, William 90, 312
Robinson, Girard S 67, 103, 357
W. S., & Co 67, 98, 270, 1095
Rochester University 541
Rodgers, Capt. John 869, 873, 874, 885, 892, 993
Roebling's Sons, John A., Company 570
Rogers, Charles W 1232
Roosevelt, R. B 1248
Rosenstein Brothers 67, 68, 96, 1084, 1112, 1113, 1115
Ross, B. R 898
Rothe, J. T 1201
Rothrock, Dr. J. T 426
Rottaken, H. H 1174
Rowe, Capt. E. L 841
Roys, Thomas W 281
Rule, Richard 1174
Russell, Albert, & Sons 777
Russell Mills Company 12, 68, 91
Russia Cement Company 19, 68, 69, 97, 1137, 1144, 1151
Rutter, J. M 481
Ryan, Capt. Joseph 862
Ryder, John A 69, 458, 1169

S.

Saint Jerome hatching station 1170, 1228
Salisbury, S 267, 858
Salvin, O 159
Sanford, F. C 275
Sartorius, Dr 994
Sawyer, E. A 743
John A 69, 90, 306, 309, 856
Scammon, Capt. C. M 69, 105, 639, 640, 1129, 1130
Scandinavian Packing Company 1071
Schacht & Brothers 1105, 1106
Schmidt, C., & Co 69
S., & Bro 96, 97, 1112, 1115, 1116
Scholl, J. C 143, 156, 166
Schoodic hatching station 1224
Schott, Dr 265
Schuermann, C. W 479
Schumacher, Paul 244, 245
Schuyler, Herman P 1176

Page.

Scott, D. W 155
George W 816
R. A., & Co 702
Scribner's Sons, Charles 6, 103, 105
Scudder, N. P 167, 168, 174
Seabury, Capt. H. W 293
Sea World Publishing Company 70, 105
Sellman, Henry 70, 96, 1064
Sennett, G. B 184
Sevey, J. A 1132
Sewall, Day & Co 12, 70, 91, 723
Shaffer, D 264
G. H 1176
Shardlow, Joseph 1128
Sharp, J. C 256
T. C 260, 261, 262
Shaw, B. F 70, 100, 1021
Sherman, Richard U 1175
Shindler, A. Zeno 71, 102
Shipley, A. B., & Sons 71, 94, 858, 925, 926, 927, 948, 969, 982, 983
Shoemaker, G 141, 152, 181
Shotwell, J. R 472, 1200, 1207
Shufeldt, Dr. R. W 143, 146, 147, 148, 161, 181, 182, 460, 484
Shute, C. H., & Son 300
Siewerd, F. H., & Bro 71, 96
Signal Service Bureau 527, 528, 529, 535
Sigsbee, Commander Charles D ... 71, 100, 560, 563, 572, 580, 584, 585, 587, 589, 593
Simms, James M 71, 91
Sisty, W. E 1174
Skinner, G. M 931
Slack, J. H 1208, 1248
Small, E. E 1146, 1147, 1150
I. A 71, 90, 309, 312, 313, 872, 1021
Smiley, C. W 71, 105, 1176
Smillie, T. W 71, 102, 709, 831
Smith, Edward Meigs 1175
Everett 71, 100, 1204
Greene 141, 146, 169, 182
James A 965
M 145, 149, 150, 152, 157, 177
N. G 1020
Seth 72, 90, 324, 331
Smithsonian Institution 72, 104, 525, 526, 529, 535, 536, 1160, 1162
Sneed, H. H 1175
Snow, B. S., & Co 1102
Franklin, & Co 1082
Loum, & Co 72, 90, 327, 354, 833, 848
Spalding, Dr. Edward 1175
Soluble Pacific Guano Company 72, 97, 1153
South Carolina Fish Commission 1160, 1188
Southwick, J. M. K 751, 853, 865, 905, 1020, 1050
Stanley, Henry O 72, 104, 986, 1174
Starling & Stevens 267, 700
State Department 525, 535
Stearns, R. E. C 127, 129, 254, 258, 263
Silas 72, 103, 105, 247, 428, 430, 431, 432, 433, 434, 435, 436, 438, 439, 440, 442, 444, 445, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 471, 494, 850, 1197
Steck, Daniel 1203

Page.

Stejneger, Dr. L 183, 184, 628, 640, 641
Sterling, Elisha 1176
Stilwell, E. M 72, 99, 102, 1240
Stimpson, Dr. William 123, 127, 174, 245, 252, 255, 260, 261, 428, 444
Stinemetz, B. H., & Son 1117, 1118, 1119
Stone, Livingston 72, 99, 267, 695, 701, 851, 868, 994, 1103, 1105, 1176, 1208, 1210, 1231, 1248
Story, Charles O 684, 685
Joseph 684, 686
Stratton, Capt. I 612
Streets, Dr. T. H 166, 486
Stuart, Dr 173, 174
Suckley, Dr. George 128, 467, 486, 1119
Sumichrast, Prof. F 148, 150, 151, 152, 153, 171, 172, 181
Swan, J. G 72, 94, 105, 165, 244, 360, 371, 474, 487, 639, 707, 708, 763, 764, 777, 781, 798, 800, 819, 833, 835, 839, 846, 852, 853, 863, 868, 875, 877, 882, 887, 890, 895, 897, 899, 906, 907, 908, 921, 922, 923, 924, 958, 964, 973, 983, 989, 994, 1022, 1029, 1102, 1103, 1105, 1119, 1130, 1135, 1150
Sweeney, R. O 1175
Swift, Jireh 73, 90

T.

Taggart, J. T 1174
Tanner, Lieut. Z. L 73, 100, 591
Tarr, James H 73, 92, 735
Tarr & Wonson 73, 92, 735
Taylor, Amasa 758, 972
James 73, 92, 352
Dr. L. H 464, 475, 481, 483
Thomas 73, 99
William 73, 90, 873
Tennessee Fish Commission 1160
Texas Fish Commission 1160, 1173, 1189
Thaxter, S., & Son 8, 13, 73, 74, 92, 728
The Century Company 36, 93, 104, 823
The George W. Miles Company .20, 57, 97, 1147, 1152
The Miller Berth and Life Saving Mattress Company 58, 93
Thomas, John 926
Gen. George H 1128
Thombs, John 867
Thompson, H. H 1176
John H 74, 95, 336, 359, 1176
J. S. W 1176
Throckmorton, S. R 1174
Thurber, H. K. & F. B., & Co .. 1067, 1072, 1074, 1076, 1079, 1082, 1085
Tiffany & Co 19, 74, 75, 98, 1120, 1125
Tillamook Packing Company 96
Todd, H. L 75, 102
Tolman, J. W 155
Tower, A. J 75, 76, 77, 95, 795–797
Townsend, H. A 245, 251, 252, 253, 254, 255, 259, 261
Treadwell, G. C., & Co 1118
Treat, Capt. U. S 1022
True, Frederick W 623
Turner, G 163

Page.

Turner, L. M.....148, 149, 151, 167, 171, 405, 409, 412, 415, 416, 473, 867, 869, 876, 879, 894
S 144, 146, 156, 159, 161, 164

U.

Underwood, William, & Co ...1072, 1073, 1077, 1080, 1085
Union College..... 541
Union Fish Company 1067, 1086
Union Oyster Company 1075
United States Albumen Manufacturing Company.....77, 97, 1151
Beacon Light and Signal Company 78, 92
Bureau of Navigation.... 728
Coast and Geodetic Survey ...8, 13, 25, 91, 100, 104, 514 517, 527, 581, 582, 589, 595, 597 599, 600, 728, 730
Hydrographic Office 8, 13, 91
Interior Department...78, 104, 525
Census Office..... 104
Patent Office..... 104
National Museum..... 78, 104
Navy Department 78, 91, 529
Nautical Almanac Office. 91
Signal Service Bureau..93, 407, 416
State Department..... 525, 535
Treasury Department ...78, 79, 80 81, 91, 92, 104
Bureau of Statistics..... 104
Life-Saving Service 92
Light-House Board..... 91
War Department....81, 82, 83, 523, 525, 528, 535
University of Indiana..... 541
Utah Fish Commission.....1160, 1189

V.

Van Altena & Scheltus.....83, 94, 960
Van Burkalow, Hon. M. S 912, 916
Van Brunt, C 1176
Vansant, H. H 256, 257, 261
Van Vliet..... 482
Vassar College 541
Velie, Dr. J. W 456, 865, 873
Vermont Fish Commission.....1159, 1160, 1189
Verrill, Prof. A. E.....83, 105, 132, 187, 188, 189, 191 235, 265, 561, 565, 574, 575, 620
Virginia Fish Commission 1160, 1189
Voss, Adolf.83, 92, 757, 780, 839, 841, 847, 853, 863, 872
D. C..... 281, 755
J. A.... 1053
O. C..... 83, 92
Vreeland, Cornelius E..... 251, 255

W.

Walker, Col. S. T..... 144, 164
Ward, G 182
War Department.....523, 525, 535
Washington Territory Fish Commission .1160, 1189
Watkins, Peter..... 256, 258
Webb, Dr 609
Webster, Prof. H. E 131, 132, 577
Weeks & Potter 1150
Wells, L..... 166
Welsher, H. W..... 460, 462
Werrich & Wandel 1126
Wesleyan University 541
West Coast Packing Company..... 1070
Westerberger, Frank..... 1128
Weston, William H 734, 778
Western Union Telegraph Expedition.... 527
West Virginia Fish Commission.....1160, 1189
Wheeler, C. L 640
Whipple, Lieutenant..... 886
Whitall, Tatum & Company..... 579
White, Dr. C. A 83, 103, 255
Whitehurst, Dr 130, 172, 429, 436, 437, 439, 443, 444, 453, 454
Whitman, J. L..... 464
Widows' and Orphans' Aid Society.....666–669, 816, 817
Wilcox, Crittenden & Co.....13, 83, 92, 105, 267, 725, 734, 737–779, 820, 836, 853, 858, 867, 871, 962, 972, 1000, 1001, 1062
Wilkes Exploring Expedition.....532, 869, 888, 896, 897, 920
Williams, C. A., & Co 84, 90, 305, 307, 315, 317, 345, 349, 350, 353, 845, 1027
Capt. H. E..... 643
J. & Co 1071
Williams College..... 540
Willis, J. R..... 254
Willitts, Joseph..... 814, 983
J. C.....84, 94, 422, 441, 442, 443, 447, 985
Wilson, A. A.....245, 253, 261, 262, 268
Sir Samuel..... 1249
Winchell, Prof. A 462, 483
Wing, J. & W. R.....84, 98, 310, 341, 356, 843, 1130
Winslow, Lieut. Francis .8, 84, 103, 105, 185, 247, 259
Master C. McR 247, 253, 258
Wisconsin Fish Commission 1160, 1189
Wolf, S 177
Wolff & Riesing...84, 96, 1084, 1086, 1113, 1114, 1115
Woltz, George 84, 91, 701, 1019
Wonson, Everett P 84, 102
Wood, Reuben 84, 93, 94, 905, 983
Lieut. William M 84, 92, 766
Woodberry, Capt. D. P 172, 449
Woodbury, Mills..... 84, 91, 722
Woodruff, G. N..... 1174
Woodworth, J. M 151
Wood's Holl hatching station 1163, 1170, 1218
Worrall, James 84, 100
Worthen, C. K 164
Wright, Isaac H 85, 99, 1212
Wroten, William G 85, 99, 1236
Würdemann, Gustavus 429, 432, 440, 451
Wyeth, John, & Brother 85, 98, 1150
Wyoming Fish Commission..... 1160
Wytheville hatching station 1170, 1218

X.

Xantus, F..... 150
J 143, 153, 163, 165, 264

Y.

Yale College 540
Yarrow, Dr. H. C.....161, 422, 426
Young, A. R..... 612
Wm. M..... 896, 912
Younglove, J. E..... 469

INDEX OF OBJECTS.

Page.

A.

Abalone fishery.....187, 193, 194, 1044
meats, dried 194, 1103
Abalones, catalogue of..... 244, 245
Aberdeen hooks..... 925, 926
Aboriginal harpoons.....873, 875, 893, 894
hooks 919
knives..... 834
lines 959
nets..... 992, 993
spears 867–871
whaling apparatus.....15, 16, 360–386
Accessories, fishing tackle..... 919
hatching apparatus 1228–1231
of nets..... 1000
of whaler's outfit 352
Acclimatization of fishes 1247
Accumulator, dredging 572
Acipenser brevirostris, ovaries of..... 1196
oxyrhynchus, ovaries of 1196
sturio 1169
Adhesive eggs, apparatus for hatching... 1216
Adirondack boat..... 702
Aerating pump..... 1240
Alarms, fog.....660, 661, 732, 733, 734
Alaska, explorations in 527, 528, 529
statistics of fisheries of..... 398
fishes of.....389, 390–398, 405–420
Albany-beef or sturgeon 1044, 1107, 1116
Albatross, steamer.....543–550, 1164
Albumen from fish eggs..... 1151
Alden's evaporated foods 805, 1102
Aleut fishermen..... 664
Alewife-fishery 1044
Alewife, ovaries of..... 1194
propagation of.....1169, 1170, 1218
Alewives, method of pickling.....1044, 1064
Algæ, marine.....7, 612, 621
Allen's bomb lance..... 328
gun harpoon 314, 317, 318
Alligator, cast of..... 5
Alligator-ivory..... 1128
leather 1048, 1120–1126
oil 1147
teeth 1048, 1128
Almanacs..... 660, 728
Ambergris 1047, 1150
American salmonoids in alcohol..... 6
whalemen 276
Amia calva, ovaries of..... 1196
Amphipods 121
Anchors 662, 754, 758, 774, 775, 961, 962
Anchovies, imports of.....1038, 1044

Page.

Angler's camp outfit..... 985, 986
food 814
portable house..... 810
Angling, illustrations of.....902, 903, 904
tackle 902–985
Anguilla rostrata, young of..... 1246
Animal traps 353, 1027
Apparel 663, 787–802
Appropriations for fish commissions..... 1160
Aprons 792, 796
Aquatic birds.....5, 139–184
mammals..... 623–644
Arrow-heads..... 362
Arrows 895–902
and bows 358
Artificial baits.....929–945, 1029
flies 932–945
Atlantic salmon, sketch of 903
Ausable boat..... 702
Awl for pricking fish bladder..... 850
Axes, head 337
Indian 361, 362
whaleman's 337

B.

Bag-filler..... 1091
Bag for marine-glass 354
Bags for clothes.....799, 800, 801
Bailers..... 343, 776, 777
Bailie-Tanner thermometer attachments.. 590–593
Baird-seine 569, 570, 993
Bait-choppers..... 846, 847
knives..... 837, 838
mill 847
pail 984
Baits, artificial..... 929, 945
Balaena mysticetus, fishery for..... 294
Baleen..... 475, 1129–1132
Ballast 679
Banded Porgy..... 1170
Banjo, whaleman's..... 355
Barbed implements..... 865
Barker's bomb harpoon 319
Bark canoes.....689, 706, 719, 720
cape..... 798
lines 958
Bark for making twine 376, 377
Barnacles eaten by Indians..... 364
Barometers..... 659, 720
Barrel lifters..... ...779, 1062
Barrels..... 796, 797
Bar-weir..... 1022
Baskets for fish-lines..... 973, 983
for sealing implements 375, 376

	Page.
Baskets used by Indians	362
Basque whalemen	276
Bass, canned	1066
in Great Lakes	1044
in Southern States	1045
sea	1169
striped	1169, 1170
Bass-drails	928
flies	931-945
trap	1023
Bastard snapper, ovaries of	1198
Batrachians, casts of	5
Batrachus tau, ovaries of	1195
Beam trawls	562–565, 996
Bear-skin caps	365
cloak	374
Bear-trap	1027
Beaver furs	1048, 1117, 1118
Bed clothing	799, 801, 811
Belaying pins	662, 754
Bell, cook's	820
whaleman's	352
Belly-band	352
Belts, whaleman's	342
Beluga harpoons	378, 379, 876, 893, 894
lance-butts	383, 893, 894
oil	1146
Benedict rake-dredge	561, 562
Berths	678, 680
Bethels	809
Bibles or books of blubber	292
Bidarka	706, 720
Bidarra	706
Bilge-hooks	779
Binnacle	680
Birch bark for torches	1029
Bird-furs	1048, 1119
Birds, analysis of exhibits	5
catalogue of	139–184
mounted groups	181–184
Bivalve shell fish	246–267
Black bass, sketches of	903
Blackfish, cast of head	639
blubber-hook	335
fishery	299, 633
gear	912
head oil	1146, 1147
hooks	926
irons	872, 873
poke for buoy	304
Black-skin	359
Black whale	635, 642
Bladder wrack	1150
Blake, description of steamer	554–559
dredge	560
trawl	563–565
Blankets	362, 799
Blind boat-steerer	343
Block Island boat	718
Blocks	662, 737, 738, 739, 740
blubber	333
dredge	573, 574
Blubber-chains	338
fids	291, 338
forks	345

	Page.
Blubber-gaffs	345
hooks	290, 334, 335
knives	291, 292, 339, 340, 341
pikes	287, 344
spades	288, 289, 337
tackle	333
toggles	290, 291, 338
Bluefish, canned	1066, 1107
drails	928
hooks	926
in Middle States	1045
in Southern States	1045
jigs	928
ovaries of	1195
sketches of	90
tackle	905, 913
Boarding houses	808
knives	287, 291, 292, 339, 340
Boats	656, 685–708, 717–720
bark	706, 719, 720
Block Island	718
carry-away	694
cat-rigged	689
Chebacco	653, 671
Chesapeake	708
Chinese	720
cutter	689, 717
dugout	719
flat-bottom	698
portable	702
round-bottom	694
salmon	695
sardine	718
schooner-rigged	693
seine	694, 697, 718
sharpy	718
sloop-rigged	689
skin	706, 720
square-stern	694
Boat-bucket	276, 303, 304
builders' materials	759
detaching apparatus	766, 767
dredge	559, 560
fittings, analysis of exhibits	12, 13
gear, whalemens'	276
grapnel in whale-boat	302
header	276
hooks	662, 749, 750, 751
hook, whaleman's	290, 333, 334
horn	304
lanterns	303, 304
piggin	304
shop	721
spades	288, 289, 302, 337
steerer	276, 301
waifs	348
Bob, mackerel	863
Bolts	762
Bomb-harpoons	284, 319
lance harpoon	286
lances	285, 286, 328–332
Bone	1048, 1128–1132
Bone-dust of sturgeon	1136
Bone hooks	363, 919
Boneless cod	1100, 1102, 1117

Page.

Boneless cusk 1101
fish, apparatus for preparing ... 1055–1057
fish compressor 1055
fish factory 1059
haddock 1100, 1101
hake 0111
herring 1116
Bone-scrapers 349
yarn 290, 347
Bonito, ovaries of 1195
spermaries of 1192
Bonnet 359
Books used by fishermen 660, 778, 818–820
Boom rests 759, 780, 781
Boot-jack, whaleman's 352
Boots 798
Bothus maculatus 1194
Bottlenose whale 634, 640, 641
Bottom set-lines 915
Bowhead whale 294, 642
Bow-oarsman 301
Bows and arrows 358, 362, 895–902
Boxes for packing fish 1057, 1060, 1066–1098
Braces for boats 761
Branding tools 1061, 1062
Brand's bomb-lance 328, 329
darting-bomb 332
whaling guns 279, 321
Breast hooks 760
Breech loaders 279
Brevoortia tyrannus, ovaries of 1197
spermaries of 1192
Brine-salted alewives 1044
mackerel 1106
mullet 1106
Brine-salting, apparatus for 1061, 1064, 1094
methods of 1040, 1041
Brook trout 1169, 1170, 1171
Brooms 775, 776
Brown's gun-harpoon 315, 316, 318
gun-lance 331
whaling-gun 322
Brush, ice 385
Brush-weir 1022
Buckets, case 342
oyster 270
transportation 1236
Buckeye 672, 673
Buckling, canned 1116
Buel's baits 930
Bug-lights 346
Builder's models of vessels 681–689
Bumpers 760
Bumper for hand-lines 961
Bung-buckets 778, 780
thief 354, 1092
Buoy-lines 384, 723, 957, 958
Buoys 304, 365, 368, 372, 373, 384, 781, 963–965
of blackfish poke 304
of seal skin 365, 372, 373, 384
Buoy-swivels 963
Burbot, ovaries of 1196
Burrs 760
Bushings 740
Butterfish, ovaries of 1195

C.

Page.

Cables 722, 723
Caledonian minnows 929
California gray-whale fishery 294
gun harpoon 319
salmon 903, 1169, 1171, 1172, 1173
whaling rocket 279
Camels 274, 275, 300
Cameo shells 245
Camp kettle 810
Cane, whalebone 355
Canned buckling 1116
bluefish 1066, 1107
boneless herring 1105, 1116
caviare 1081, 1112
chowders 1080, 1081, 1111, 1112
clams 1072, 1074, 1110
codfish 1066, 1082, 1106
codfish balls 1080, 1102, 1112
crabs 110, 1078, 1079, 1085, 1110, 1114
cusk 1066
eels 1067, 1114, 1115, 1116
finnan haddies 1087
flounders 1116
green turtle 1079, 1111
haddock 1066, 1087, 1116
halibut 1067, 1087, 1107, 1116
herring 1067, 1083, 1084, 1107, 1113, 1114, 1115
lobster ... 115, 116, 1076, 1078, 1085, 1109, 1110
mackerel ... 1071, 1072, 1081–1084, 1107, 1112, 1113, 1114
oysters .. 221, 222, 1074, 1075, 1076, 1085, 1115, 1116
oysters, apparatus for packing ... 269
products 1106, 1117
products, boiled with vegetables 1111, 1112
dry-salted 1116, 1117
in brine 1112
in sauces 1112–1115
in vinegar 1115
plain boiled 1106, 1111
smoked 1115, 1116
salmon .. 395, 397, 1067, 1071, 1085, 1108, 1109, 1115, 1116
sardines 1084, 1085, 1086, 1112, 1113, 1114, 1115
sea bass 1107, 1113
shrimp 120
smelts 1107, 1116
sturgeon 1044, 1084, 1107, 1116
sturgeon-extract 1117
terrapin 1079, 1111
Canneries, models and illustrations of .. 1064, 1088, 1090
Canning fish, methods of 1040, 1041
Canoes 361, 369, 689, 706, 707, 708
Makah Indian 361
whaling 369
Cans for observing ocean currents 597
transportation 1231–1237
Canvas 658, 722
preservative 734
Cape, bark 798

	Page.
Caps	794, 795
Capstans	724, 725
Carassius auratus	1169, 1170, 1218
Carlisle hooks	925
Carp	1169, 1170, 1173, 1218
Carp ponds, Baltimore	1173
Washington	1173, 1224, 1225, 1228
Carry-away boat	694
sloop	689
Cars for transporting fry	1168, 1171, 1218, 1219
Carsley harpoon	305
Case-bucket	287, 342
chain	338
straps	288
Cast-nets	999
Cat-boats	693
Catfish nippers	858
Caviare	1044, 1081, 1112
Cedar-bark blankets	362
capes	362
Center-boards	766
Centropristis nigricans, ovaries of	1194
Cero	1169
Cetaceans, casts of	5
decrease in abundance	631, 632
economic value of	630, 631
natural history of	629, 630
Chætodipterus faber, ovaries of	1199
Chafing gear	661, 735, 736, 737
Chain, case	338
head	338
fin	338
whaleman's	287, 288, 338
Chain-strap	282
Channel weir	1024
Chapman's baits	931
Charts	599, 600, 659, 660, 728, 729, 730
Coast-Survey	599, 600
Dredging stations, Fish Commission	600
Hydrographic Office	600
Chebacco boats	653, 671
Cheeking knives	842
Chemical composition of fish	1164
Chesapeake boats	708
Chest-beckets	356
Chester rake-dredge	560, 561
Chestertown hooks	926
Chest for clothes	800
Chinese fishermen	701, 708, 720
Chocks	662, 748, 749
Chowders, clam and fish	1080, 1081, 1111, 1112
Chronometers	660, 727
Clam diggers	846
fishery	187, 229–241
knives	846, 847
rakes	856, 857
Clams, canned	1072, 1074, 1110
catalogue of specimens	260, 261, 263
dried	1102, 1105
production of	1045, 1046
shelling	1064
soft shelled	1169
Claws for grappling	781
Clearing rings	982
Cleats	662, 752, 753, 754
Clews	662, 744, 745
Clock-oil	1147
Clocks	660, 728
Clothing	365, 374, 664, 787–802
Clubs, halibut	833, 834
salmon	833
seal	834
use of	834
Clupea æstivalis	1170, 1219
harengus, growth of	1246
ovaries of	1195
spermaries of	1191
sapidissima, ovaries of	1169, 1170, 1199, 1218
vernalis, ovaries of	1194
Clyoquot Indians	361, 362, 363
Coal-locker	680
Coats	795, 796
Cobia, ovaries of	1196
Cod, bastard	364
Codfish	1169, 1170, 1194, 1218
abundant at Alaska	392
boneless	1100, 1101, 1102
canned	1066, 1082, 1106
dressing and icing	1054, 1058
dried	1099, 1100, 1101, 1102
minced	1080, 1117
production of	1039
shredded	1101
Codfish-balls	1080, 1102, 1112
curing	1059
industry	1037, 1039
Cod-fishing vessels	714, 715, 716
Cod-gaffs	860, 861, 862
hand-lines	908, 910, 913, 914
hooks	926
jigs	928
leather	1106
Cod-liver oil	1149, 1150
apparatus for preparing	1091, 1092
Cod-nets	988
skins, dried for glue making	1136, 1137
sounds, dried	1133
tongues, dried	1135
trawl-lines	915
Cog-wheel of ivory	357
Collections of special exhibitors	29–85
Collective exhibit of United States, analysis of	1–28
Colvin's canvas boat	702
Commissioners, State Fish	1174–1176
Compasses	659, 725, 726
Connecticut sharpy	718
Cook	702
Cooper's inshaves	349, 350
knives	844, 855
Copper paint	661, 735
tanks	578, 579
Cordage	659, 722, 723, 724
Coregonus clupeiformis	1169, 1170, 1218, 1245, 1246
ovaries of	1192
spermaries of	1192
Cork floats	965
Correction curve	584, 585
Cotton lines	950–956

Page.

Cotton-seed oil 1064, 1066
Cove oysters, method of packing 221, 222
Cowfish-oil 1146
Crab-fishery 1037, 1045
Crabs, canned 110, 1078, 1079, 1085, 1110–1114
economic importance of 109–112
eaten by Indians 364
horseshoe 121, 122, 131
list of specimens 127, 128, 129
Crabs'-eyes 1133
Crab-spears 865
Cradle sieve 575, 576
Craft, whaleman's 305, 320
Crampfish oil 1149
Crates 983, 984
transportation 1237–1239
Cray fish, economic importance of 116, 117
list of specimens 129
natural history collection 607
Creels 983
Creepers, ice 386
Crustaceans, worms, &c., catalogue of 107–126
Culling crib 1061
Cullins, whalebone 295
Cultus or bastard cod 364
Cunners, dressing 1054
Cunningham & Cogan's bomb-lance 329
whaling gum 279, 323
Cunningham's darting-gun 324, 325
Cusk, boneless 1101
canned 1066
dried 1099, 1100, 1101
leather 1048, 1126, 1127
oil 1150
production of 1039
skins, dried for glue-making 1136
Cutter-rigged boats 689, 691, 717
Cutting-blocks 333
falls 290, 333, 346
spades 288, 289, 335, 336
stage 343
Cuttle-fish, catalogue of 243
dried 1105
bone 1133
Cyclopterus lumpus, ovaries of 1200
Cynoscion maculatus, ovaries of 1200
regalis, ovaries of 1195
Cyprinus carpio 1169, 1170, 1218

D.

Dams in rivers 1159
Danish fishermen 664, 785
Darting-bombs 280, 286, 332
Darting-gun harpoon 277, 278
Darting-guns 280, 323
Darts, Eskimo 892, 899
swordfish 871–873
Davit-irons 761, 1000
Dead-eyes 737, 740
Deck-hooks 742
spades 288, 337
Decoys 1029, 1030
seal 384, 385
Deep-sea dredge 559

Page.

Deep-sea hand gear 906
research, analysis of exhibits 25, 26
sounding machines 580, 584
Densimeter, Hilgard's optical 596
Diminution in fish supply 1159, 1160
Diplectrum fasciculare, ovaries of 1198
spermaries of 1192
Diplodus holbrookii, ovaries of 1198
Dip-nets 570, 851–854
Dippers, ice 385
oyster 270
pitch 356
scrap 344
Disgorgers 982, 983
Disguises 1029, 1030
Ditty-boxes 821
Doctor-fish for food 364
Dogbody 671
Dogfish hooks 926
oil 364, 1149
Dog's-hair blankets 362
Dolphin-drails 928
grains 865
Dolphins, species of 632, 637, 638, 639
Dories 657, 698, 699, 700, 719
Dory-roller 972
Double-ender 696
Doyle harpoon 308, 309
Drag, whale 303
Drag-rope 813
Drags 662, 663, 774, 775
Drailing tackle 902
Drails 928
Drawers 792
Dredge-blocks 573, 574
Dredges, clam 856, 857
naturalist 559–562
oyster 267, 268, 854, 855, 856
scallop 855, 856
Dredging accumulator 572
Dredging stations of Fish Commission 600
Dried abalones 1103
clams 1102–1105
codfish 1099, 1100, 1101, 1102
codfish cakes 1102
cusk 1099, 1100, 1101
cuttlefish 1105
fish, exports of 1038
frogs 1103
haddock 1099, 1100, 1101, 1102
hake 1099, 1100, 1101
halibut 1102
herring-eggs 1103
minnows 1105
oulachon 1102
oysters 1102
pollock 1100
porpoise 1104
prawns 1104
salmon 1102
salmon-eggs 1102
seal-meat 1104
seaweed 1105
shrimps 1104
smelts 1103

	Page.
Dried snails	1104
trout	1102
worms	1104
Drift-nets	989
Drug in whale-boat	303
Drumfish lines	913
Drum, ovaries of	1196
Dry-curing, method of	1039
Drying fish, apparatus for	1055–1059
illustrations of	1058, 1059
Dugouts	362, 689, 707, 708, 720
Dutch whalemen	276
Dwellings	721, 806–809

E.

Eagle-claw trap	1028
Ear-bone of whale	357
Earing clews	744, 745
Economic mollusca, catalogue of	185–270
Echinoderms, economic importance of	123, 124
list of specimens	132
Echinus eaten by Indians	364
Edible crabs	109–112
Eel fishery	1037
hooks	926
pots and traps	1018–1021
pout, ovaries of	1198
Eels, canned	1067, 1114, 1115, 1116
Eel-skin leather	1126
Eel-spears	865–868
Egg-reel	1238
Eggs, adhesive	1166
brook trout	1245
floating	1166
heavy	1166
lake trout	1246
salmon	1245
semi-buoyant	1166
whitefish	1245, 1246
Elacate canada, ovaries of	1196
Encircling nets	992–999
English whalemen	276
Entangling nets	987–992
Eskimo darts	892–899
hand-lines	906
harpoons	377–381
line-holder	386
netting needles	1014
pipe	358
salmon-spear	358
sealing implements	377–386
shoes	358
spoon	358
thread	358
whaling apparatus	360–386
Essence of spruce	354
Eubalæna, fishery for	294
Evaporated foods	805, 1102
Explorations, scientific	513–541, 599, 600
Explosive harpoons, projected from guns	320
thrust by hand	319
lances	328–332
Exports of fishery products	1038
Eye-hooks	743
plates	761
protectors	359, 799

F.

Factory, boneless fish	1059
menhaden oil	1092, 1093
Falls, cutting	346
Feather blankets	362
Fenner's portable boat	703
Fertilizers	1048, 1049, 1151–1154
Fids	778
blubber	291, 338
splicing	357
Finback whales	294, 635, 642
Fin-chain hook	290, 334, 335
Fin-chains	287, 288, 338
Finnan haddies	1042, 1087
Fish-baskets	851
Fish commissions, appropriations for	1160, 1161
first formed	1159
work of	1161–1166
Fish culture, analysis of exhibits	20–25
history of	1159–1174
Fish culturists, names and photographs of	1175
Fish-dippers	851
Fisher or pekan fur	1048, 1119
Fishermen	664, 782–787
Chinese	664
Danish	664, 785
figures of	782–784
German	664
Greek	664
habits of	818–821
houses of	665, 721, 806–809
Indian	664, 786
Irish	664, 784
Italian	664
Kanaka	664, 787
Negro	664, 782, 786
Norwegian	785
photographs of	784–787
Portuguese	664, 785, 786, 787
Provincial	664, 784, 786
Swedish	664, 785, 786, 787
Fishes, Adirondack	6
Alaska	6, 389, 390–398, 405–420
American salmonoids	389, 398–400, 420–427
analysis of exhibits	6
casts of	6
catalogue of collections	387–510
economic fresh water	403, 404
genera of fresh water	389, 402, 403, 457–494
Gulf of Mexico and East Florida	6, 389, 400–402, 428–457
in alcohol	6
photographs and sketches of	6
Fish-glue	1048, 1049, 1133–1144
grains	865–867
guano	1048, 1049, 1151–1154
Fish Hawk (steamer)	550–554, 1164
Fish-hooks	919
Fishing-bag	986
bows	896
grounds, models and charts of	8
lances	847
lines	946
Indian	363
reels	965–973

Fishing-rods 974-982
snoods 946
vessels and boats, analysis of exhibits 12
wheel 1027
Fish-lures 1029
markets, appliances for 1095, 1096, 1097
photographs of 1096, 1097
meal 1103
oil 1147-1150
apparatus for preparing 1091-1094
industry 1047
pans 577
pews 862, 863
pots 1018
prickers 850
scales 1095, 1132, 1133
slides 1017, 1027
spears 363, 865-895
traps 1017-1027
ways, chute or trough 1202
counter current 1206
deflected current 1203-1206
pool 1201, 1202
Fittings for vessels and boats 722-781
Fixed nets 987
Flagging iron 1062
Flags, whaleman's 348
Flake-yards 1058, 1059
Flakes for drying fish 1055, 1058
Flat-bottom boats 699-702
Flaying-knives 842
Flies, artificial 929-945
Flitching-knives 840
Floating eggs, apparatus for hatching ... 1166
Float-lines 384
Floats, cork 965
glass 965
harpoon 964
line 963
net 965
seal-skin 964, 965
tin 965
trawl-line 965
whale 372, 373
wooden 963
Florida sponges, fishery for 124-126
list of 131-136
Flounder fishery 1037
ovaries of 1194, 1197
spears 865
Flounders, canned 1116
Fluke chain 287
lance 327
Fluker 335
Fluke-ropes 287, 290, 346
Fly-books 945, 946
lines 947, 948
Fog horns 304, 660, 661, 732, 733, 734
Folding boats 689
Foods, fishermen's 13, 665, 803, 804, 805, 814
Indians 363, 364, 365
whaleman's 355
Forceps for naturalists' use 578
Forks, blubber 345
Forks, fish 862, 863
horse-piece 345
squid 863
Former, squid-jig 864
Forward cutting-stage 343
Fossils in rock formations 620, 621
Frankfort reel 969
Freeman's bomb-harpoon 319
Fresh fish, imports and exports of 1038, 1039
Fresh halibut vessels 715, 716
Fresh-water fishes, genera of 389, 402, 403, 457-494
sponges 609-612
Frogs, dried 1103
Frost-fish spears 866, 867
Fundulus pisculentus, ovaries of 1193
Funnel-cap 679
traps 1017-1023
Furniture for camp 810, 811
Fur industry 1047, 1048
robes 1119
Fur-seals, fishery for 626-628
group of 5, 643
natural history of 625, 626
skins of 1038, 1118
Furs 1117, 1118, 1119
Fyke-nets 1021

G.

Gadus morrhua, ovaries of 1194
propagation of 1169, 1170, 1218
Gaff-hooks 859-863
Gaffs, blubber 345
Galway hooker 691, 717
Games 818
Indian 367
Gammon knees 681
Garpike, ovaries of 1196
Gay Head Indians 664
Gelatine from Irish moss 1144
Geographical distribution, maps of 8
German fishermen 664
Ghenn's lance 331
Giant squid 6, 191
Gig, terrapin 860
Gill-nets 987-992
netting 1006, 1007
Glass floats 965
jars 579
Globiocephalus fishery 295
Gloucester harbor, views of 710
zoological collections 1165
Gloves 793
Glue factory 1094
from fish-skins 1048, 1049, 1133-1144
Gob-stick 834
Golden Ide, propagation of 1170, 1218
Goldfish, propagation of 1169, 1170, 1218
Goosefish, ovaries of 1192, 1196
Goose-spear 895
Gorge-hooks 363
Grampus fishery 633
oil 1146
Grapnels 652, 754, 758, 974
Grasping implements 857, 858
Grass lines 959

Page.

Gravitating trap, Sigsbee's 567–569
Grayling, propagation of 1169
Gray whales 634, 641
Greek fishermen 664
Greenland whale fishery 294
Green turtle, canned 1079, 1111
Grommet-irons 277, 310
Grommets 662, 747, 748
Grouper fishery 1037
Grudchos & Egger's bomb-lance 330
whaling-rifle 279
Guano from fish-oils 1049
from fish-skins 1048, 1049, 1151–1154
Gulf of Maine, model of 599
Gun-harpoons 279, 281, 314–319
lances 284–286
Guns 276, 902
breech-loading 323
darting 323, 324, 325
rocket 325, 326
shoulder 321–326
swivel 320, 321
whaling 320–326
Gunwale supporters 760
Gut-leaders 959
lines 959
Guy-rope 347
Guys 290

H.

Habits of fishermen 13, 818–821
Haddock, boneless 1100, 1101
canned 1066, 1116
dried 1099, 1100, 1101, 1102
fishery 1037, 1039
fresh 1037
gaff 861
oil of 1150
ovaries of 1192
production of 1037, 1039
propagation of 1169
smoked 1042, 1060, 1061, 1087, 1116
trawl-line 916
Hake, boneless 1100, 1101
dried 1099, 1100, 1101
dry-curing of 1058
fishery 1037, 1039
oil of 1150
ovaires of 1196, 1198, 1199
skins for glue 1136
sounds for glue 1134
spermaries of 1192
Halibut, abundant at Alaska 391
canned 1067, 1107, 1116
dried 363, 1102
fishery for 1037
fresh, packing of 1054
gaff 860, 861, 862
hooks 926
killer 833, 834
oil from head of 1149
ovaries of 1199
smoked 1042, 1087, 1105, 1116
tackle 906
trawl-line 916

Page.

Haliotis fishery 193, 194
Haliotis-shell nose pendants 365
Haliotis shells 244, 245
Hammers 764
Hammocks 811
Hand-barrows 1055
Hand-cuffs, whaleman's 353
harpoons 276
implements 833
lances 282–284, 301, 326, 327
Hand-lines, cod 908, 910, 913, 914
sinkers for 960
Hand mincing-knife 292
sieves 576, 577
tackle 902–913
Hanks 662, 741
Harpoon-arrows 895
Harpooner 276
Harpoon-gun 279
lines 383
poles 372
sheaths 320
Harpoons, aboriginal 361, 873–875, 893, 894
beluga 378, 379, 876, 893, 894
bomb 319
conch 865
darting-gun 312, 313
double-barbed 305
Eskimo 377, 381
for raising sunk whales 311, 312
gun 314–320
Indian 368, 371, 372
non-explosive 305–320
projected from guns 314–320
prussic acid 313, 314
single-barbed, fixed heads 307, 308
toggle 308–311
two barbs and fixed heads 305–307
two-flued 305, 306
walrus 320
whaleman's 305–320
Hatched fish, statistics of 1173
Hatcher, Chester's 1216
Hatchery, first in the United States 1159
Hatching-apparatus 1208–1230
accessories of 1228–1231
for adhesive eggs 1216, 1217
for floating eggs 1217
for heavy eggs 1208–1211
for semi-buoyant eggs 1211–1216
Hatching barges 1226, 1227
baskets 1210
boxes 1208, 1209, 1210, 1211, 1214, 1216
buckets 1216
cones 1213
crate 1209
houses 1219–1221
jars 1210, 1212, 1214, 1215
stations, list of 21–24, 1218, 1219, 1247
steamers 1164, 1221, 1226, 1227
trays 1209
troughs 1208, 1209, 1211, 1213, 1214
Hats 794, 795, 796, 797
Indian 362

Page.

Haul-seines, aboriginal 993
bait 993
cod 993
herring 992
netting for 1009, 1010
Head-ax 337
Head-chain 287, 288, 338
net 986
spades 288, 336
strap 288
Heading-knives 841
Heel-tapper 652, 682
Hegeman's portable boat 703
Hemitripterus hispidus 1194
Hemp lines 956, 957
Herring, as sardines 1043, 1044, 1083–1086
canned .. 1043, 1044, 1067, 1083, 1084, 1107, 1113, 1114, 1115
eggs, dried 1103
gill-nets 988, 990, 991
imports and exports of 1038
lake 1044
smoked 1042, 1086, 1087, 1105, 1116
ovaries of 1195
propagation of 1169
seines 992, 993, 996
smoked 1042, 1060, 1061, 1086 1087, 1105, 1116
spermaries of 1191
torching of 1030
vessels, photographs of 716, 717
weirs 1022–1027
Hilgard's ocean salinometer 595, 596
optical densimeter 596
Holders, line 386
oar 762
Holothurians 123
Hook clearers' 983
Hooked implements 859–864
Hooks, aboriginal 919
barbless 927
blubber 290, 334, 335
bone 920
brass 920
cod 924
copper 919
decorated 928
flitcher's 862
fin-chain 290, 334, 335
gorge 363
halibut 922, 923, 924
horn 920
ivory 920
line 290
lip 290
modern 924–928
plain 924
safety 574
shell 359, 919
single 924
treble 927
whaleman's 290, 333–335
wooden 921
Hoops 662, 741
Horns, fog 304, 660, 661, 732, 733, 734

Page.

Horn-swivels 962, 963
Horse, hand-line 961
Horse-mackerel oil 1149
Horse-piece fork 345
Horse-pieces of blubber 292
Horseshoe crab 121, 122, 131
Hospital pen 679
Houses of fishermen 665, 721, 806–809
Humpback iron 277, 278, 311, 312
whalebone 295
whale fishery 294, 295
whales 635, 642
Hunting-case 358
Hurdy-gurdy 971
Hybrids 1247
Hydrographic Office charts 600

I.

Ice-brush 385, 985
creepers 386
crushers 1052, 1053
dipper 385, 854
hooks 780
houses 679, 1054, 1055
mallets 780, 1052, 1053
Icing fish 1054, 1055
Idus melanotus, propagation of 1170, 1218
Imports of fishery products 1038
Indian fishermen 664, 786
whalemen 293
whaling, description of 368–370
whaling apparatus 360–386
Inshaves, cooper's 349, 350
Insurance office 815
policy for vessels 815
Invertebrates, analysis of exhibits 7
collection by U. S. Fish Commission 600
Investigation of waters, catalogue of collection illustrating 511–621
Irish cutter 691
fishermen 664, 784
moss 1037, 1144
Iron crotch in whaleboat 302
strap 279
Isinglass 1044, 1133, 1137
Isopods 121
Italian boats 695
fishermen 664
Ivory 1048, 1127, 1128
alligator 1128
narwhal 1127
sperm whale 1127, 1128
walrus 1127
hooks 920

J.

Jackets 789, 795, 796
Jars, glass 579
Jig-molds 928
rasp 929
tackle 356
Jigs, cod 928
lead for making 929
mackerel 928

Page.

Jigs, squid 863, 864
weakfish 928
Journals of fishing voyages 815, 816
of whaling voyages 350, 351
Jumpers 664, 789, 790
Junk-strap 288

K.

Kanaka line 357
whalemen 293, 664, 787
Kelleher's bomb-lance 326
Kelley's gun-harpoon 314, 315, 316
Kelp knives 834
lines 363
Ketches 651, 652, 670
Killer whales 633
Killicks 757, 758, 961, 962
King crab 121, 122, 131
Kingfish, ovaries of 1195
Kinsey hooks 925
Kirby hooks 925
Knight-heads 680
Knives 834–847
bait 837, 838
blubber 291, 292, 339, 340, 341
boarding 291, 292, 339, 340
bone 363
cheeking 841
cod-splitting 838
cooper's 844, 845
cusk-boning 1057
fish 835
flaying 842
flitching 839
heading 841
hunter's 837
Indian 363
leaning 292, 341
mincing 287, 292, 340, 341, 838
mincing-machine 292
net-mender's 845
rimming 843, 844
ripping 838
roly-poly 1056
scraping 844, 845
sealer's 341
sheath 836
skinning 842, 1056, 1057
slivering 840
snow 359, 835
stone 835, 836
throating 841
whaleman's 287, 291, 292, 339, 340, 341
Kyaks 707

L.

Labyrinth traps 1017
Lake Erie pound-boat 700
Lake trout, propagation of 1169
Lamprey, ovaries of 1199
Lamps 730, 731, 732, 985
Landing-nets 852, 853
Lance-bag in boat 302
heads, Indian 373
poles 373, 374

Page.

Lances 847–850, 892
bomb 328–332
fishing 847
fluke 327
for stopping running whales 327
Indian 373
projected from guns 328–332
recovered from whales 330, 331
sea-elephant 327, 850
seal 327, 381, 382, 847–850
thrust by hand, explosive 326
thrust by hand, non-explosive 326, 327
walrus 327, 381, 382, 850
whaleman's 282–287, 326–332, 847
Lance-warp 276
Lantern-kegs 276, 303
Lanterns 346, 730, 731, 732, 811, 812, 985, 1030, 1230
Laws, fishery 1165, 1166
Lay-out lines 916, 917
Leaders 662, 751, 752, 959
Leaning-knives 292, 341
Leather, alligator 1048, 1120–1126
cod 1106
cusk 1048, 1126, 1127
from fish-skins 1126
mammal 1119, 1120
reptile 1120–1126
salmon 1048, 1126
seal 1048, 1119, 1120
sea-lion 1048, 1119
sturgeon 1126
Leech, American medicinal 122, 123
Leg-irons, whaleman's 354
Le Page's fish glue 1136–1144
Lepidosteus osseus, ovaries of 1196
Life-rafts 822, 823
boats 822
Life-saving materials 822, 823
Lifting-nets 1000
Lighter 701
Lights, whaleman's 346
Lily irons 871–873
Eskimo 379, 380
Limerick hooks 925
Limpets for food 364
Line-holders 386, 973
Line-hook, whaleman's 333
Linen lines 948, 949
Line-rollers 971, 972
Lines, bark 958
buoy 386
cotton 950, 956
float 384
grass 959
gut 959
hand 906–914
harpoon 383
hemp 956, 957
Kanaka 357
kelp 363
linen 948, 949
manila 957, 958
root 958
seal-skin 959
silk 946, 947

Page.

Lines, sinew 959
stage 342
tow 374
trawl 915, 917, 918
whale 347
Line-sinkers 960
spreaders 907
swivels 962, 963
tubs 276, 302, 303
Liquid glue from fish-skins 1138
Literature of fish culture 1247–1249
read by fishermen 818, 819, 820
Live boxes 983
cars 1050, 1051
Lizards 751, 752
Lobster boat 690
boiling factory 1090
cars 1050
fishery 112–116, 1037, 1046
industry 1037, 1046
nets 999
traps 1020, 1021, 1026
Lobsters, canned 1046, 1076, 1078
list of specimens 129
production of 115, 116
Log-books 666, 815, 816
reel 353
Logs, patent 725, 726
of whaling-voyages 350, 351
Log-slate 351
Long-handled bailer 343
lines 915
Lookout boat 700
bows 353
Lophius piscatorius, ovaries of 1192, 1196
Lota maculosa, ovaries of 1196
Lumpfish, ovaries of 1200
Lures 1029

M.

Macheta knife 357
Mackerel, apparatus for packing 1061–1064
bob for capturing 863
brine-salted 1040, 1041, 1106, 1112
canned ..1040, 1041, 1071, 1072, 1081, 1084, 1089, 1090, 1107, 1112, 1113, 1114
gaffs 860
hand-lines 915
hooks 926
imports and exports of 1038
industry 1037, 1040
oil of 1148
ovaries of 1195
pocket 984, 998, 999
purse-seine 996
rimmers 843, 844
vessels, photographs of 712, 713, 714
Mackinaw trout, ovaries of 1193
Mactra solidissima, fishery for 231, 232
Main warp 276, 302
Main royal pole 353
Makah Indians, life and habits of 360–370
Mallets 780
ice 1053
serving 376

Page.

Mammal oils 1144–1147
Mammals, analysis of exhibits 5
catalogue of aquatic 623–644
Manatees 5, 628, 637
Manila lines 957, 958
Man-ropes 356
Man-rope stanchions 356
Marine algæ 612-621
Marine-glass bag 354
Marine invertebrates, collections by United States Fish Commission 600
Marline 724
spikes 778
Martha's Vineyard boat 691, 692
Mason's gun-harpoon 316, 320
Mast-gear 758, 759
Matinicus boat 690
Mats, chafing 735, 736, 737
Mattress, life-saving 822, 823
Meats for fishermen's food 803–805
Medals of Humane Society 823
Medicines 13, 665, 803, 805, 806
Melanogrammus æglefinus 1169, 1192
Melon-seed boat 693
Memorial and Record Book 819, 820
Menhaden factory 1042, 1091, 1093
guano 1042, 1048, 1049, 1151, 1154
industry 1041, 1042, 1045
oil 1092, 1093, 1147, 1148
ovaries of 1192
seine 999
spermaries of 1197
uses of 1042
steamer, model 711
Menticirrus alburnus, ovaries of 1198
nebulosus, ovaries of 1195
Merlucius bilinearis, ovaries of 1197
Meshing nets 987
Mesh measures 1013, 1014
Midship-oarsman 301
Milam reel 969
Minced cod 1080, 1117
Mincing knives 287, 292, 340, 341
Mincing-machine knives 292, 340, 341
Mink fur 1119
Minnow gangs 929
Minnows, dried 1105
Minute-glass 353
Missiles, centrifugal 892
propelled by explosives 902
propelled by throwing-stick 892, 895
simple 892
spring 895, 902
Miter-box for boneless fish 1056
Mittens 793, 794
Moccasins 798
Models illustrating results of explorations. 599
Mollusca, catalogue of 185, 270
Mollusca cephalopoda 187–192, 243
encephala 192
gasteropoda 243, 246
lamellibranchiata 246
Mollusk oil 1147
Mollusks, analysis of exhibit 6
Monhegan boat 693

Page.

Monkey-belt 342
Moonfish 1169, 1199
Mother-of-pearl 1133
Mudfish, ovaries of 1196
Mullet, brine-salted 1106
cast-nets 999
fishery 1037, 1045
Muscongus boat 690
Muskallunge 903, 1044
Musquash fur 1048, 1188
Muesel fishery 235, 236, 1037
Mussels, list of specimens 261, 262
used by Indians 364
Mya arenaria, fishery for 229–231
propagation of 1169

N.

Nacre 1133
Nailing-table 1055
Nails for boat-builders 762
Nantucket boat 694
Naturalists' dredges 559, 562
forceps 578
Nautical instruments 659, 660, 725, 726, 727, 728
Navigators 660, 728
Needle, whaleman's 342
Negro fishermen 664, 782, 784
whalemen 293
Net factory 1015
Net floats 965
Net-maker's tools 1013
Net-mender's knives 845
Net-needles 1013, 1014
Net-preservative 1015
Net-reels 972, 989
Nets 987–1000
aboriginal 992
accessories of 1000
Baird 993
bait 999
cast 999
cunner 1000
dip 570
drift 989
encircling 992–999
entangling 987–992
fixed 987
gill, aboriginal 988, 989
cod 988
herring 988, 990, 991
mackerel 992
salmon 989
shad 987
sturgeon 990
whitefish 987, 989
lifting 1000
lobster 999
meshing 987
mullet 999
pocket 992
pursing 996, 997
scoop 341
shrimp 999
towing 566
trailing 996
trammel 992

Page.

Net-sinkers 962
swivels 962
tarring machine 1015
Netting, gill 1013
tanned 1006–1009
tarred 1009–1013
white 1001–1006
preservative 734
Net-twine 1013
Newspapers 820
Nippers, hand 794
catfish 858
Noank lobster-boat 690
No Man's Land boat 695, 696
Norwegian fishermen 785

O.

Oars for whaleboat 301
Obstructions in rivers 1159
"Ocean trout," canned 1067, 1083
Octopus 191, 192
Official classification of exhibits 87–105
Oil, alligator 1147
beluga 1046
blackfish 1146, 1147
bowhead-whale 1145
cod-liver 1149, 1150
cowfish 1146
crampfish-liver 1149
cusk-liver 1150
dogfish-liver 1149
grampus 1146
haddock-liver 1150
halibut-head 1149
harbor-seal 1146
horse-mackerel 1149
humpback-whale 1145
imports and exports of 1038
mackerel 1148
mackerel-shark 1148
menhaden 1147, 1148
oulachon 1150
pollock-liver 1150
porpoise-jaw 1146, 1147
right-whale 1145
sea-elephant 1146
seal 1146
skate 1149
sperm 1150
squid 1147
sturgeon 1150
sulphur-bottom whale 1146
sunfish 1149
swordfish 1149
thresher-shark 1149
whale 296–299, 1144–1146
Oil-bags 1091
bailers 343, 1092
Oiled clothing 665, 795, 796, 797
Oil for food, whale 370
Oil-rendering apparatus 1090–1094
Oil-skimmer 1092
sucker 1092
Okhotsk Sea fishery 664
Oncorhynchus chouicha propagation 1169, 1171, 1219
Oquassa trout, propagation of 1169

Page.

Ordnance, whaling.....279, 320, 321
Osgood's folding boat 702, 703
Osmerus mordax, propagation of 1169
Ostrea virginica, list of specimens..... 249–259
propagation of ...1169, 1170, 1218
Otter fur.....1048, 1117
Oulachon, dried 1102
oil of 1047
rake..... 863
Outfit of whaling vessel..... 351
Ovaries of fish 1192–1200
Overalls 788, 789
Oyster-bed, model of 259
maps of..... 8, 247
Oyster-boats 708
buckeye 672
cannery 1064
cans and kegs 1051, 1053, 1094, 1095
cultivation, maps illustrating 268, 269
dredges.....267, 268, 854, 855, 856
fishery..... 218–228
Connecticut 224, 225
Delaware..... 226
implements..... 267, 268
Maine 222, 223
Maryland..... 226, 227
Massachusetts 223
New Hampshire..... 223
New Jersey 225, 226
New York..... 225
Pacific coast..... 227
Rhode Island..... 223, 224
south of Virginia..... 227
Virginia..... 227
Oyster industry..... 218–228, 1037, 1045
Oysters, apparatus for preserving..... 269, 270
apparatus for transporting 269, 270
artificial propagation of..... 200–218
biology of.....198, 248–259
breeding habits of..... 198
canned.....1074–1076, 1085, 1110, 1115
collection of..... 6
enemies of..... 265, 266
exports of..... 1039
method of canning..... 221, 222
natural history of 200–218
pearl 264
peculiarities of growth 253, 254
production of 187, 1045
specimens illustrating growth .. 251, 252
Oyster-scrapes 854
shovels 851
shucking 220, 221
steamer..... 711
steaming 221, 222
tongs.....267, 268, 857, 858
tubs 270
vessels 266, 267

P.

Packing-crib..... 1061
Pack-rack..... 985
Paddles.....301, 374, 781
Pail, bait..... 984
Pans, fish 577
Pans or pieces of whale's jaw-bone..... 293
Pantry 679
Paralichthys dentatus, ovaries of..... 1200
Patents relating to fishery products ... 1097, 1098
Pawlbit..... 678
Pea-pod 696
Pearl oysters 264
Pearl-producing shells 264
Pearls 1133
Pekan fur.....1048, 1119
Pen traps 1017–1027
Perch..... 1045
Periwinkles.....244, 254, 364
Petromyzon marinus, ovaries of 1199
Pew, fish..... 862, 863
Photographs and sketches, boat-shops and ship-yards 720, 721
brine-salting fish..... 1063
canning fish.....1088–1090
carp propagation.....1242, 1243, 1245
clam-digging..... 846
fish-culturists..... 1175, 1176
fishermen 784–787
fishes 495–510
fishing towns 809
fish merchants 784, 785, 786, 787
fresh-fish trade.....1053–1055
game fishes 903, 904
glue-making 1094
hand-line fishing 913
hatching stations 1221–1227
houses of fishermen 806–809
lobster-boiling 1090
lobster fishery..... 137
net-fishing 989–992
net-making 1015
oil-making 1094
oyster-dredging 856
porpoise-shooting 890
sail loft 722
salmon propagation .1241, 1242, 1243, 1244
seal-hunting 891
seine-fishing 994–999
shad propagation.....1242, 1244
smoking fish 1060, 1061
spearing fish 891
trap-fishing 1023–1027
trawl-line fishing..... 917
vessels and boats..... 709–721
whale fishery 293
wharves and markets 1094–1096
Phycis chuss, ovaries of 1198, 1199
spermaries of..... 1192
tenuis, spermaries of..... 1192
Physeter macrocephalus, fishery for 294
Pickle-curing, methods of 1039
Pierce & Eggers whaling-gun 279, 323
Pierce's bomb-lance..... 329
darting-bomb 332
darting-gun..... 323, 324
darting-gun harpoon 312, 313
Piggin 276, 304

	Page.
Pike, ovaries of	1200
Pike perch, propagation of	1169
Pikes, blubber	344
pot	344
Pinkey	672, 681, 711
Pinnipedia, list of	643, 644
Pipe, Eskimo	358
Pitch-dipper	356
Plaice, ovaries of	1200
Plates of tortoise	1132
Platforms used when cutting whales	343
Pleuronectes americanus, ovaries of	1194
glaber, ovaries of	1197
Pogonias chromis, ovaries of	1196
Polaris Expedition	534
Pollachius carbonarius, ovaries of	1197
Pollock, dried	1100
ovaries of	1197
production of	1039
Pollock-liver oil	1150
Pollock-skins for glue-making	1136
Pomatomus saltatrix, ovaries of	1197
Poncho	362
Porgy, ovaries of	1198
Porpoise-jaw oil	1146, 1147
meat, dried	365, 1104
Porpoises, species of	632, 633, 638
Portable boats	689, 702–705
house	810
Portuguese fishermen	664, 785, 786, 787
whalemen	293
Potomac fish-lighter	701
Pot-pikes	344
spade	288, 289
Pound-boat	657, 700, 701
Prawn fishery	117–121
Prawns, canned	1079, 1104
dried	1104
Preservation of products by boiling	1090
by brine-salting	1061–1064
by canning	1064–1090
by drying	1055–1061
of fresh fish	1051–1055
of live fish	1050, 1051
Preservative fluids	661, 734, 735
Prionotus evolans, ovaries of	1193
Private exhibitors, analysis of collections	29–85
Probes, snow	385, 844
Products of fisheries, analysis of exhibits	16–20
Protection of fish by fish-ways	1201–1207
by legislation	1165, 1201
by purifying streams	1207
Providence River boat	692
Provincial fishermen	664, 785, 786
Prussic acid harpoons	277, 278, 313, 314
Publications on fish culture	1176–1190, 1247–1249
Pump for aerating	1240
Pungy	673
Purrels	662, 752
Purse-seine	996
boats	694, 697, 718
Puzzles	819

Q.

	Page.
Quadrant	659, 728
Quahaug fishery	233, 234, 235
Quahaugs	260, 261, 1037, 1046
Quivers	996
Quoddy boat	694, 695, 696, 718

R.

	Page.
Rainbow Trout, propagation of	1171, 1172
Rake dredges	560, 561
Rakes	856, 857, 863
Ray, cow-nosed, ovaries of	1197
Reach boat	696
Receptacles for sealing implements	375, 376
used when cutting up whales	341, 342
Rechten's darting-gun	325
Red Snapper fishery	1037
Reel and log chip	353
Reels	965–973
Billinghurst	969
Leonard's	969
multiplying	970
net	972, 989
salmon	969
simple	965
trawl-line	971
trout	969
Refrigerators, for foods	1051, 1052
for retarding eggs	1168, 1230
Reports of Aid Society	816
Humane Society	823
Reptile leather	1048, 1120–1126
oil	1147
Reptiles, analysis of exhibits	5
Results of fish culture	1245, 1249
Rhinoptera quadriloba, ovaries of	1197
Rhytina	628, 629
Ribbon seal, skin of	643
Riding sail	680
Rifled whaling-gun	320
Rigged models of vessels	670–681
Rigging, standing	724
Right-whale fishery	294
Ripping knives	838, 839
Rivets for boat building	762
Roccus saxatilis, propagation of	1219
striatus	1169, 1170
Rocker-sieve	575, 576
Rocket-bomb	276, 286
guns	279, 281, 325, 326
Rockets	332
Rockfish, ovaries of	1197
Rock formations from deep water	620, 621
Rock-lobster	116, 117
Rods, fishing	974–982
Roly-poly fish	1100, 1101
nife	1056
Root lines	958
Rope preservative	734
Ropes	659, 722, 723, 724
fluke	287, 346
guy	347
man	356
of whale sinew	368
used by whalemen	290, 346, 347
wire	570, 571
Rowlocks	301, 767–774
Roys' whaling gun	279
Rudder fixtures	765, 766

S.

Page.

Saber 357
Safety hooks 574
Sail-loft 721
Sails 658
Indian boat 362
Sail-twine 723, 724
Salinometer, Hilgard's ocean 595, 596
Salmo irideus, propagation of 1170, 1171, 1218, 1219, 1246
Salmon, abundant at Alaska 395–397
Atlantic, propagation of ... 1169, 1170, 1171
California, propagation ... 1169, 1171, 1172, 1173, 1218, 1219
canned 1042, 1043, 1067–1071, 1085, 1108, 1109, 1115, 1116
dried 364, 1102
exports of 1037
land-locked, propagation of 1169, 1171
methods of canning 1043
Penobscot 1173
production of 1042, 1043
Schoodic, propagation of 1169
smoked 1089, 1105
Salmon-berry 364, 367
boat 695
club 834
eggs, dried 1103
fishery of Alaska 395–397
flies 931–945
fyke-fishing 1026
gaff 859, 860
gill-nets 989
hooks 859
industry 1037, 1042
leather 1048, 1126
Salmonoids in alcohol 6
Salmon spears 358, 867, 868
tackle 902
Salmo salar, propagation of 1169, 1170, 1218, 1245, 1246
Salt for curing fish 1090
pens 679
ships 711
Salvelinus fontinalis, propagation of 1169, 1170, 1171, 1218, 1219, 1245, 1246
namaycush, propagation of ... 1169, 1193
oquassa, propagation of 1169
Sand fleas, &c., list of specimens 130, 131
Sarda Mediterranea, ovaries of 1195
spermaries of 1192
Sardine boat 718
canneries 1064, 1088, 1089
industry 1037, 1043
Sardines, canned 1043, 1044, 1084, 1085, 1086, 1112, 1115
imports of 1037, 1044
menhaden as 1041
methods of canning 1044, 1088, 1089
production of 1043, 1044
Sardine steamer 711
Scales, anglers 986
fish, for jewelry 1132, 1133
weighing 1095
Scallop dredges 855, 856

Page.

Scallop fishery 187, 237, 238, 239
Scallops 262, 1037
Scallop shells for rattles 364
Scandinavian fishermen 664, 785
Schoodic salmon, propagation of 1169, 1170
Schooner, origin of 652
three-masted 680, 681
Schooners, models and illustrations of 671–789, 711–717
Scientific explorations, by colleges 540, 541
by Interior Department 525
by museums and societies 536–540
by Navy Department 529–535
by Signal Service Bureau 528, 529, 535
by Smithsonian Institution 525, 526, 529, 535, 536
by State Department 525, 535
by State Surveys 526, 527
by Treasury Dement 525, 528
by U. S. Coast Survey 514–517, 527, 528
by U. S. Fish Commission 517–523
by War Department 523–525, 535
investigation of waters 511–621
Scomberomorus maculatus, ovaries of 1200
propagation of 1169, 1170, 1218
regalis, propagation of 1169
Scomber scombrus, ovaries of 1195
Scoop nets 341, 853, 854
Scoops 776, 777, 851
Scotch whaleman 280
Scout horns 779
Scragg whale 641, 642
Scrap dipper 344
Scrapers, deck 775, 776
whalebone 349
Scrapes 854
Scratchers, seal 384, 385
Scrimshaw work 355, 356, 357
Scrubs 775, 776
Scup or scuppaug, ovaries of 1193
Sea bass, canned 1107, 1113
gear 911, 912
ovaries of 1194
Sea-clam fishery 231, 232
Sea-elephant 643
club 834
lances 327, 850
oil 1146
Seal decoys 384, 385, 1030
Sealer's club 834
gaff 861
knives 341
Seal harpoons 377–381, 876–891
hunter's stool 386

Page.

Seal hunting 365
implements 375, 377–386
Sea-lion leather 1048, 1119
Seal-lances 327, 381, 382, 847–850
leather 1048, 1119, 1120
meat, dried 1104
oil for food 364
Seals, list of 643, 644
Seal-scratchers 384, 385
Sealskin buoys 372, 373
floats 964, 965
lines 959
Sealskins 365
Seal spears 375, 383
Sea-otter fur 1037, 1048, 1117
harpoons 884
raven, ovaries of 1194
slugs eaten by Indians 364
snails, catalogue of 243–246
trout, canned 1067
trout line 912
urchins, edible 123
Seaweed 1037, 1105
Seine-blocks 1000, 1001
boats 694, 697, 718
rings 1001
Seines, Baird 569, 570, 993
haul 992, 993
purse 996
Sieves, for zoological work 574–577
Semi-buoyant eggs, apparatus for hatching 1166
Serving-lanyards 376
mallet 376
sticks 361, 376
Sextants 660
Shad-fishery 1037, 1044, 1045
gill-nets 987
ovaries of 1199
propagation of 1169, 1170, 1172, 1173, 1218
seine boat 694
tackle 902
Shadines 1041
Shark hooks 927
oil 364, 1148, 1149
Sharpies 657, 700, 718
Sharp-stern boats 694–698
Sheath knives 836
Sheaths for harpoons 320
Sheaves 737, 740
Sheepshead gear 911
hooks 926
scales 1132
Shell-fish, apparatus for preserving 269, 270
apparatus for transporting 269, 270
fishery 187, 266–268
Shell hooks 359, 919
ornaments 264, 265
Shells 1133
Shelter 13, 665, 803
Ship-bread 355
Shipment of eggs 1167
Ship's papers, whale 352
Ship worm 265
yards 720

Page.

Shirts 790, 791
Shoes 801
Eskimo 358
whaleman's 354
Shooting box 705, 706
Short warp 302
Shoulder guns 279, 902
breech-loading 323
muzzle-loading 321, 322
Shovels 777, 851
Shredded codfish 1101
Shrimp boat 701
cast-nets 999
fishery 117–121, 1037
Shrimps, canned 121, 1079, 1085
dried 121, 1103
economic importance of 117–121
list of specimens 129, 130
Shucking oysters 220, 221, 270
Shumagin Islands fishery 664
Sieve, oyster 269
Sight decoys 1029
Sigsbee-Belknap sounding rod 589, 590
Sigsbee's correction curve 584, 585
deep-sea sounding machine 580–582
dredging accumulator 572
gravitating trap 567–569
water specimen cup 593–595
Silk lines 946, 947
Silk-worm gut 959
Silver gar, propogation of 1169
Silvery hair-tail, ovaries of 1198
Simple missiles 892
Sinew lines 959
Sinkers, hand-line 960
net 962
set-line 961
stone 960, 962
Siscowet Trout, ovaries of 1193
Skaneateles trolling-line 905
Skate oil 1149
Skates 353
Skimming net 1229
Skimmers, oyster 270
Skin boats 689, 706, 720
Skinning-knives 842
Skylight 679
Slate, log 351
Slaughter-houses in vessel 679
Sling-ding gear 909
Slippers 798, 799
Slivering-knives 840
Sloops 689, 693, 717
Small-arms, whaling 279–282, 321–326
Smelt fishery 1037
nets 851, 852
ovaries of 1200
propagation of 1169
Smelts, canned 1067, 1107, 1116
dried 1103
smoked 1116
Smith's gun-harpoon 314, 315, 316, 317
Smoke-houses 1060, 1061
Smoked alewives 1044
buckling 1116

Page.

Smoked eels 1116
fish, apparatus for preparing ... 1060, 1061
exports of 1038
flounders 1116
haddock 1042, 1116
halibut 1042, 1105, 1116
herring 1042, 1106, 1116
salmon 1042, 1105, 1116
smelts 1042, 1116
sturgeon 1044, 1105
whitefish 1042, 1106
Snails, dried 1104
Snakes, casts of 5
Snap and catch 'em hooks 1028
Snatch blocks 1000
Sneak boat 691
Sneck hooks 926
Snoods 946
Snow-knife 359, 835
probe 385, 844
Snows, vessels called 7
Societies, aid 666–669, 816–818
Socks 792
Sorting dishes 577
Sound decoys 1030
Sounders 862
Sounding leads 589
machines 580–584
rod 589, 590
South Sea whalebone 295
Spades, boat 288, 289, 302, 337
blubber-room 288, 289, 337
clam 846
cutting 335, 336
cutting-in 288, 289
deck 288, 337
for cutting out throat bone 337
for cutting slivers 336
for mortising holes in blubber 336
head 288, 336
pot 288, 289
scarfing and leaning 335, 336
sliver 336
throat 288, 337
whaleman's 288, 289, 335, 336
Spading flukes 289
Spanish mackerel, ovaries of 1200
propagation of ..1169, 1170, 1218
Sparus pagrus, ovaries of 1198
Spawn-dipper 1229
nippers 1229
Spawning-pans 1229
race 1229
Spear-heads 869
Spears, aboriginal 867
salmon 358
seal 375, 383
single pointed 865
thrusting 847
walrus 383
with detachable heads 871
with fixed heads 865
with throwing sticks 892, 895
Special exhibitors, analysis of collections. 29–85
Spermaceti 1038, 1047, 1145

Page.

Spermaries of fish 1191, 1192
Sperm-oil, statistics of 296–299
soap 1145
Sperm whale fishery 294
Sperm whales 633, 634, 641
ambergris of 1047
jaw-bone of 1128, 1129
teeth of 1127, 1128
Splicers 721, 778, 779
Splicing cable, photograph 721
Splicing-fid 357
Splints for making traps 1018
Splitting knives 838, 839
Sponge fishery 124–126
Sponges 1037, 1144
fresh-water 609–612
list of specimens 132, 136
Spoon, Eskimo 358
Spoon baits 929
Sportsmen's boats 693, 705
Spring traps 1027
Sproat hooks 926
Spun yarn 721, 724
Spy glass 659, 728
Square-stern boats 689–694
Squeteague, ovaries of 1195, 1200
sounds of 1134
Squid forks 863
Squid-jig former 864
Squid jigs 863, 864
Squid oil 1147
Squids 187–192, 243
Squirrel fish, ovaries of 1198
spermaries of 1192
Stage, cutting 343
Stage-lines 342
Stamp, whaleman's 351
Stanchions, man-rope 356
Standing rigging 724
Star fish, injurious to oysters 123, 124
Statistics of fish culture 1247
of oyster fishery 227, 228
of whale fishery 296–299
Steamer Albatross, description of 543, 550
Blake, description of 554–559
Fish Hawk, description of 550–554
Steamers, fishing and whaling .275, 655, 670, 710, 711
Stearine from fish oils 1148, 1149
Steel-wire dredge rope 570, 571
for deep-sea sounding 585, 588
Steerers 659, 725
Stenotomus chrysops, ovaries of 1193
Stizostedium americanus, propagation of. 1169
canadense, ovaries of 1200
Stone knives 835, 836
sinkers 960, 961
Stool, seal-hunter's 386, 395
Storehouse for dry fish 1059
Stoves 680, 813, 814
Strad 735
Stranahan folding boat 703–705
Strap, lance 347
Striking a whale 275
Striped bass, propagation of 1169, 1170
Striped sea-robin, propagation of 1193

Page.

Stroke oarsman 301
Stromateus triacanthus, ovaries of 1195
Sturgeon, canned 1044, 1084, 1107, 1116
caviare 1044, 1081, 1112
extract 1117
isinglass 1044, 1135
leather 1126
oil 1150
ovaries of 1196
production of 1044
propagation of 1169
scales 1133
smoked 1042, 1044, 1105
Sulphur-bottom whales 635, 642
Sunfish oil 1149
Sun shade 813
Surf boat 696, 697
tackle 904
Swabs 565
Swedish fishermen 785
Swivel gun-harpoon 318
guns 280, 320, 321, 902
hooks 743
Swivels, buoy 963
horn 962, 963
line 962, 963
net 963
slot 963
Swordfish, fishery for 1037
oil 1149
spermaries of 1192

T.

Table sieve 574, 575
Tackle, angling 902
black bass 902
drailing 902
hand 902–913
salmon 902
set 915–917
shad 902
surf 904
trolling 902
trout 902
whiffing 902
books 946
Taffrail 680
Tail-stock 961
Tangle-frames 565
Tangles 891
Tanks, copper 578, 579
Tanner sounding machine 583, 584
Tanning machine 1016
Tarring machine 1015
Tautog, ovaries of 1193
Temple-gig 277
toggle 277
Tench, propagation of 1169, 1170, 1218
Terrapin 1037, 1045, 1079, 1111
gig 860
soup 1111
stew 1111
Tetrodon onitis, ovaries of 1193
Thermometer attachments 590–593
Thimbles 662, 746, 747

Page.

Thole-pins 767, 774
Three-masted schooner 680, 681
Throat-chain toggle 290, 339
Throating-knives 841
Throat-spades 288, 337
Throw-lines 905, 906
Throwing-sticks 386, 892–895
Thrusting spears 847
Thymallus tricolor, propagation of 1169
Tinca vulgaris 1169, 1170, 1218
Tinder box 304
Toad fish, ovaries of 1197
Tobacco, angler's 814
Toggles, blubber 290, 291, 338, 339
throat chain 339
Toggle irons 277, 278, 308–311, 872, 873
Tomcod, ovaries of 1194
Tongs 857, 858
oyster 267, 268
Tools used by fishermen 820, 821
Torch dragon 1029
Torches 725–732, 1029, 1030
Torching herring 1030
Tortoise shell 1132
Tow-irons 760
lines 374, 958
Towing nets 566
Trailing nets 996
Trammel nets 992
Transportation appliances 1094–1097
of eggs 1236–1240
of fry 1168, 1231
of spawning fish 1235
Traps, fish 1017–1029
funnel 1017–1023
illustrations of 1023
labyrinth 1017
lobster 1020, 1021
pen 1017–1023
pocket 1017
pound 1022
weir 1022
Travelers, topsail 678, 759
Trawl killicks 961, 962
lines 915, 917, 918
wings 566
Trawls, beam 562–565
Trichiurus lepturus, ovaries of 1198
Tripple swivels 963
Trolling-tackle 902–905
spoons 931
Trough-net 1229, 1230
Trousers 788, 795, 796, 797, 800
whaleman's 355
Trout, dried 1102
lake 1044
propagation of 1169, 1170, 1171
flies 931–945
hooks 925, 926
tackle 902
Try-works 275, 300
gear 343, 344
lanterns 346
Tub-oarsman 301
oarlock 301

Page.

Tubs, oyster 270
Tunnies, sketches of 903
Turban shells 244
Turtle 1037, 1079, 1111
Turtles and terrapins, casts of 5
Turtle-soup 1111
stew 1111
Two-flued iron 277

U.

Unarmed clubs 833
Under-running rocks 961, 962
stick 916
Unio shells 264

V.

Vessels' papers 13, 815
Vials for naturalists' use 579
Virginia hooks 925

W.

Waifs, boat 348
Walrus 644
bone 1128
harpoons 276, 320, 883, 884
hide lines 959
hunting 283
implements 381, 382
iron 277
ivory 1127
lances 327, 850
leather 1048, 1120
spears 383
War-club 357
Warps, lance 347, 348
Watch oil 1147
Water bucket 276
deck-irons 759
jugs 780, 813
keg 304
specimen cups 593–595
temperature 1164
Water-wheel 1230
Waukegan fishery 1062
Weakfish gear 912
jigs 928
line 912
sketch of 903, 904
Wearing apparel 663, 787, 792
Wedding rig of schooner 716
Wedges 763
Weirs 1022–1027
Whaleboat 275, 276, 300, 301–304
Whale blubber for food 369
Whalebone .. 295, 296–299, 375, 1038, 1090, 1129, 1130
bear-traps 1027
scrapers 349
Whale-fishery appliances 14–16, 1046
by Indians 294
collection illustrating 271–386
in Hudson Bay 274
in North Pacific 275
origin of 293, 294
statistics of 296–299
Whale-lines 303, 347
Whaleman's harpoons 305–320

Page.

Whaleman's hooks 290, 333–335
knives 291, 292, 339, 340, 341
lances 282–287, 326–332
logs 350, 351
needle 342
ropes 346, 347
spades 288, 289, 335, 336
Whale oil, for food 364, 370
grades of 1047
imports and exports of 1038
Indian method of obtaining ... 369, 370
preparation of 1090
production of 296–299
samples of 1144–1146
Whaler's outfit 351
Whaleship 274, 275, 300
Whales, commercial value of 293–295
natural history 629–635
Whale-sinew, dried 1104
rope of 363, 368
Whaling apparatus, aboriginal 360–386
by Indians 368–370
canoe 369
fleet 709
grounds 296–298
guns 276, 279–282, 302, 320–326, 902
implements, Eskimo 370–380
lances 847
steamer 275, 710
stick 378
vessels, statistics of 296–299
Wharves, fish 709, 710, 1094, 1096, 1097
Whiffing tackle 902
Whistle 820
Whitefish gill nets 987–989
methods of freezing 1053, 1054
of Alaska 393, 394
ovaries of 1192
packing of 1062
propagation of 1169, 1170, 1171, 1172, 1219
smoked 1042, 1044, 1105
spears 870
White-horse 359
White whale, casts of 5, 639
Whiting gear 912
ovaries of 1198
Widows' home 808
Winches 971
Windlasses 659, 724, 725
Wing pens 679
Wire for sounding 585–588
Wire rope 570, 571
Withes for making canoes 764
Wood's boat-detaching apparatus 766, 767
Worms, dried 1104
economic importance of 122, 123
list of specimens 131, 132
ship 265

X.

Xiphias gladius, spermaries of 1192

Z.

Ziphioid whales 634, 640, 641
Zoarces anguillaris, ovaries of 1198
Zoological stations, marine 597–599

BUCHBINDEREI
VON
AUGUST WERZ
MÜNCHEN

BSB Bayerische StaatsBibliothek

MDZ Münchener DigitalisierungsZentrum Digitale Bibliothek

Goode, G. Brown,

Descriptive catalogues constituting a report upon the exhibit of the fisheries and fish culture of the U. S. of America, made at the London Fisheries Exhibition 1883

Washington 1884

Zool. 84 ls-27
urn:nbn:de:bvb:12-bsb11893609-4